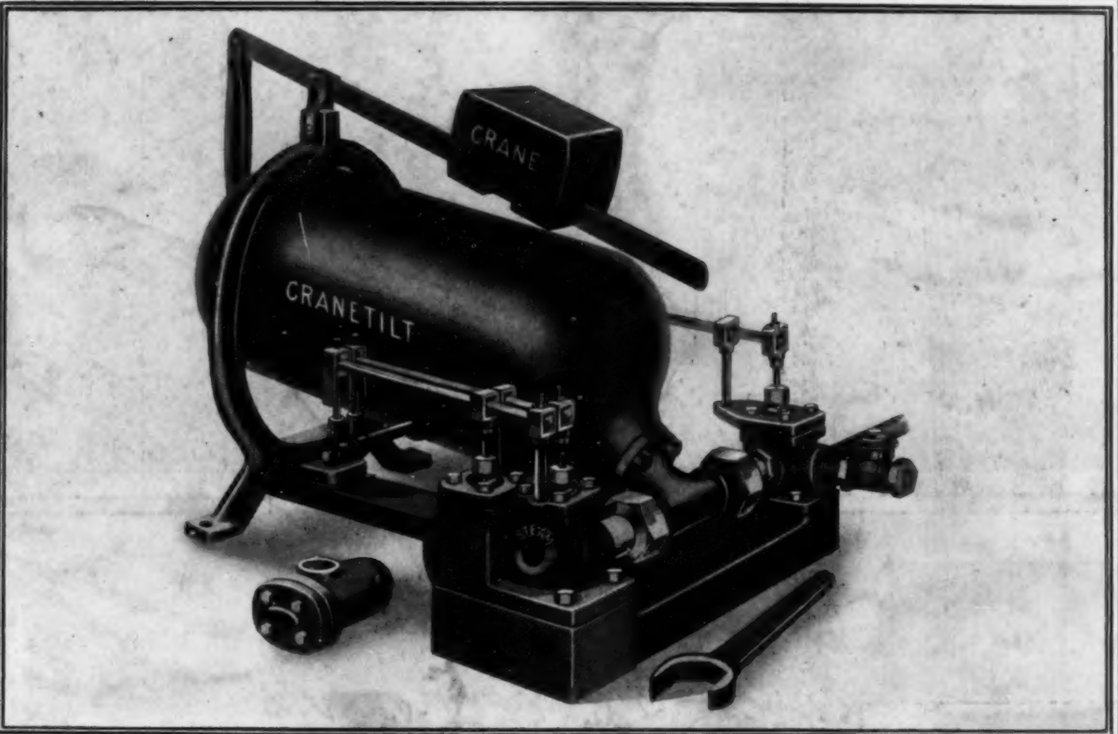
April 9, 1923

McGraw-Hill Co. Inc.

25 cents per copy

CHEMICAL & METALLURGICAL ENGINEERING



CHEMICAL
& METALLURGICAL
ENGINEERING

A consolidation of
ELECTROCHEMICAL & METALLURGICAL INDUSTRY *and* IRON & STEEL MAGAZINE

H. C. PARMELEE, Editor

Volume 28 New York, April 9, 1923 *Number* 14

Economic Statesmanship

FROM some quarters comes the comment that the preliminary report of the Committee on Business Cycles and Unemployment just off the press is merely an attempt to lock the stable door after the mare is gone. These critics are ill advised, we believe, even though in many industries unemployment has long since given way to labor shortage. The fact remains, as Secretary HOOVER points out in introducing the committee's report, that "the slumps are in the main due to wastes, extravagance, speculation, inflation, overexpansion and inefficiency in production developed during the booms." The strategic point of attack, therefore, is during a period such as the present when rising markets and rapidly expanding operations threaten to precipitate us into another trough of depression and hard times.

This report is from a committee of prominent business men and economists, appointed in September, 1921, during the President's Conference on Unemployment. For over a year it has been engaged in a most exhaustive investigation into the underlying causes of periodic business depression. Its conclusions, therefore, are of more than passing importance, even though the committee proposes no startling new remedies or economic panaceas.

The suggested measures fall into two classes—those designed for the control of excessive expansion during the boom periods and those that will reduce the extent of the subsequent decline. In the former category are the recommendations for measures which will impress the business executive with a better understanding of the business cycle. This implies a knowledge of the fundamental data of business—the intimate and complete statistics of production, stocks, consumption and employment. Stress was also laid upon checking credit expansion by the banks and the possible control of inflation by the judicious exercise of power already held by the Federal Reserve system. But of basic importance, it would seem, is the recommendation that the individual should conduct his own business so as to avoid dangerous overextension of inventories and fixed capital—the two primrose paths to business failures and unemployment. Stabilized operation on the part of all industries is, of course, the keynote of the whole program.

The committee finds several methods for breaking the fall during the decline in the business cycle. It points out that construction can act as a sort of balance wheel on the ups and downs of business. A large program of governmental and public utility construction in times of depression is a well-known remedy of recognized effectiveness, and we are now reaching a period when the opposite policy of retardation is perhaps in order. Other suggestions applying more directly to unemployment during depression refer to the use of unemployment reserve funds, and the expansion of federal, state and farm employment bureaus.

Apart from its conclusions and recommendations the report is significant in that it forms a part of a vast program of national issues that we like to place in the category of economic statesmanship. The guiding influence in this movement is Secretary HOOVER, to whom the public is indebted for his efforts to replace politics with business judgment and constructive economics.

Scrap the Obsolete

WHEN the comedy financier buys into a manufacturing concern, votes himself onto the board and into authority, he requires, first of all, something to boast about. Most of us grow vain with success, and we should not begrudge vanity in others; it is therefore natural and to be expected that such a new authority "wallah" should feel his oats and step high. The chances are that he knows practically nothing of the business and he will be quick to declare that he does not propose to address himself to "details." There is but one thing he can do besides drawing the salary that he provides for himself, and that is to cut out what he calls "dead wood." Stockholders love to hear of the elimination of expenses, because expenses inhibit dividends. Something must be cut out to enable him to announce his slogan, and if the scientific adviser does not beware, the research laboratory will be the first thing to go. Indeed, it is up to the scientific adviser to find something that he can spare without the sequel of commercial tragedy; something that the new dictator can call dead wood, and cut out to heart's content.

But there is another side to this problem that old manufacturers who know their business, and experienced technologists as well, all too often neglect for fear of the venture. This is to scrap important parts of a plant as they become antiquated. Apparatus ceases to be *perfectly* good as soon as it is improved upon. The mere fact that an apparatus functions as well as it did several years before does not suffice if something to produce a better yield or a better quality has been invented in the meantime. Soon other apparatus is likely to show the same defect, and when a whole plant is out of date it usually requires an issue of bonds to save it—provided always, first that the bonds may be sold, and second that the banking house that sells them does not want a perpetual grip on a large part of all possible profits in the future.

In one important industry in the United States the average life of a layout is from 15 to 20 years. In Germany it has been the custom to renew the same type of plant about once every 5 years. Now, how on earth

can an old works of 20 years' standing compete with an establishment that has been renewed three times during the same span? It is out of the question. It takes both courage and understanding to scrap an apparatus that is unimpaired by wear. What to put on the scrap heap is one of the hardest decisions to make in industry. Results are likely to be fatal if ignorance enters into the discussion. It takes a real man to choose.

Apropos of this very problem let us quote a sentence from a late address on education by Dr. STEARNS of Andover before a group of newspaper and magazine editors and writers. We think it fits. "It is the very abyss of error," he exclaimed, "to hold that the purpose of education is to teach boys to obey. Our business is to teach them to choose!"

"The Heathen Chinee Is Peculiar"

"WHEN I lived in China," said a companion at dinner lately, "I had very little difficulty in getting things done. That is, I had practically no more difficulty after I learned how to give instructions. This consisted in announcing what I wanted or the thing I desired done, and saying no more about it. Trouble came whenever I attempted to tell a Chinaman *how* to do a thing. That invariably confused him, because in every possible way the East differs from the West. The carpenter draws his plane toward him instead of pushing it away; he draws his saw up instead of forcing it down, and the saw-teeth are adjusted to this practice; the new-born infant puts the flat of his hands up to his eyes when he cries, and not his knuckles the way our babies do; indeed every method seems to be as different from ours as it can be made to be. Tell a Chinaman what you want, and he will get it or do it for you in his own way, but do not undertake to tell him how. He is competent and practical, but also in his own way."

This brought to mind a little 94-page book, called "Inorganic Chemistry," by Z. C. DAZE, paper-covered, printed in English in China. Mr. DAZE is now teaching chemistry in his native country, but a number of years ago he was a student under Prof. RALPH H. MCKEE, now of Columbia University but then stationed at the University of Maine, at Orono. It was Professor MCKEE who showed us the little books of his erstwhile pupil.

The "Inorganic Chemistry" steps right into the subject by means of a case system, very like the method of teaching law which is current at some of our universities. Standard text-books are recommended, but no reference is made to them. The first chapter deals with general principles and contains 100 questions. Anyone who can answer 100 questions correctly has the very groundwork in chemistry that we want him to have. They are for beginners, but they are fundamental. The student has no chance to learn his lesson by rote.

Let us cite a few of them to indicate this scope. "Compare," says Question 23, "the energy contents, pressure, volume and rate of molecular action of gaseous ammonia with liquid ammonia." Question 26 wants to know if balanced reactions are of any value to a chemical manufacturer. "What conditions favor him?" is asked, and "Define chemical manufacture in terms of equilibrium," is demanded. "What relative positions do silver and gold occupy in the e.m.s., and give reasons for your answer," is Question 32. Under 9, "According to Hess' law of constant heat summations does the law of mass action hold good for matter and energy as well?" And so on. Chapter II is given over to calculations, and they are fair slices out of a chemist's life. Chapter III is devoted to carbon. Then come experiments, and after that a list of remarkably good definitions.

It is an excellent book, designed for young men who are resolved to master the subject, and it is also an effective discourager to those who would like to pass for chemists without paying for the privilege in thought and work. It is cheaply printed and bound; we doubt if it sells for over a quarter in China, but it has the stuff in it.

Professor MCKEE showed us three other booklets by Mr. DAZE, printed in Chinese. These we hesitate to expound for reasons that would attack the theory of editorial omnipotence to acknowledge. They are little works on technology that sell for about 10 cents each. One is on Pigments and Lakes with references up to date of publication in 1922. Another is on Paints and Varnishes of the same year. One was the second of two volumes called Talks on Oils, dated 1920, also containing references. The two former are illustrated with drawings. The drawings are curious, but they are all right.

"The heathen Chinee is peculiar," said BRET HARTE. He is indeed peculiar. He is also intelligent and worth while. He has imagination and the gift to do things in his own way. We believe that when our Chinese neighbors get themselves established in the science and the art of chemistry, their contributions will be immense.

Patents, Patenting And Publicity

A DISCUSSION of patents and patenting with an industrial chemical engineer recently brought out several important aspects of the question. In the first place, he emphasized that he secured patents covering processes in operation in his plant for no other purpose than to prevent the unwelcome attention of pirate "inventors"—individuals or companies whose tactics indicated a disregard of professional ethics, who made it a practice to study the patent records and, when possible, to file claims for an idea that another person had evolved and put into practical operation but which was apparently not covered by existing patents. These crooks would then forbid the original inventor from operating his own process, or allow him to do so only after payment of royalty. Disorganization in industrial work that follows such reprehensible practices is deplorable; the pirate usually has no difficulty, if the court demands it, in detailing his own researches. Only a simple outline is necessary, and the secrecy usually surrounding research is used as a camouflage. Disproof of his statement is difficult.

Science in industry is on a firm foundation, however, and our informant cited more than one instance in which, after being thus deprived of its moral right to benefit from its own initiative, a company had set to work and developed an alternative process. This was promptly patented, and technical progress was not delayed.

If the story can be made to point a moral, it is that emphasis should be paid to the necessity for corporations employing technical processes to see that future

developments are not hampered by fruitless patent litigation. The importance of adequate legal protection to permit continuous use of processes and equipment that have been developed within the organization cannot be overemphasized. The fascination of scientific achievement sometimes overshadows the need for commercial caution, but it is essential that the chemical industries, especially those in process of change and development, should take advantage of the best legal talent available for their patent problems.

Classroom Specialists

IT IS truly amazing how many things a modern engineer—even a metallurgical engineer—must know, if you listen to everybody. He must first of all have a well-rounded education in order to be an ornament to society. He must know business and business law, because he should be fitted for executive positions. He must be well trained in economics, because his opinion may be asked on the desirability of competing for foreign trade, and it certainly takes an economist and an expert mathematician even to compute the values of common articles in European currency. Oh, yes, accountancy would help here.

So it is. The engineer must be littérateur, financier, business man, accountant, lawyer, economist. And the funny part of it is that eminent educators who are advocating these things in one breath are in the next bewailing the pressure brought to bear on them by neighboring factories, making spinning tops or carpet tacks, to turn out students who have specialized on the problems of manufacture of spinning tops or carpet tacks. What we need, says the manufacturer, is a carpet tack engineer. Oh, no, says the educator, what you need is a human engineer, a management engineer!

It is hard to tell which is the more absurd. Every one has met all kinds of men appropriating to themselves whatever virtue may accrue with the use of the word engineer, like "efficiency engineer," or "sales engineer," or "management engineer," or "carpet tack engineer." The other day a big van passed by with the sign "Finnerty & Glattwitz, Moving Engineers." Moving, indeed!

These thoughts lead up to the observation that the education of the metallurgist should be more on fundamentals and less on specialties. It is impossible to become a specialist by studying in college—it is even impossible to predict what specialty a student will need in after life.

We might cite the history of a good friend. Educated as an electrical engineer, he was associated for several years with a traction company, but as an avocation he investigated many problems in magneto design and operation. When the war came he enlisted in the British army, was assigned to technical service, and spent 4 years in the air service on developmental, test and instruction work. When he was in school, what crazy person would have predicted the importance of flying machines?

Then when the war was over, there appeared to be little demand for aviation experts, so he got a job with a Cleveland engineer as an ordinary draftsman. The first task given him was to work up a machine for the manufacture of automobile license tags. It would have been absolutely impossible for either the student or the instructor, during the days when that man was in school and when there were a few two-lung Cadillacs chugging about the streets, to have conceived by the wildest stretch of the imagination the day when Fords, trucks, and automobiles would be so numerous that they have to be licensed, and that by the million.

Engineering, after all, is the application of the laws of mathematics, chemistry and physics through machines and structures for the benefit of man. What more obvious, then, that a great effort should be made toward instructing the student in these laws, and, what is equally important, by well-directed experiments teaching him how these laws are applied through various machines and instrumentalities—in other words, instructed not only in the laws themselves, but given enough practice so he can use these laws as tools? If there is any spare time, let him specialize in the literature of the Italian Renaissance or the art of the early Sumerians.

One Way to Finance New Ventures

ON A main thoroughfare of the Biggest City a relative of our old friend Mr. QUICKTURN CAPITAL is doing his bit for progress and humanity. A big sign on the door in 1,000 point type shouts "RADIUM" to the passing world. "Free exhibit of radium ores" is the gist of another poster. Sure enough, there is a table and pieces of minerals thereon. After you have gazed your fill you notice a small electric train going into a tunnel and around a track to show you how the ore is brought to the surface. Next there are some pictures of the Rocky Mountains, apparently all owned by this radium company, which, you begin to realize, must be quite an organization. There follows a more modern appeal: charts. What things do we get from our ore? Lead, silver, uraninite (sic, hic or hick?), radium! Each word printed in pink and lavender to emphasize perhaps the unique property of the ore. Pink lead and lavender radium! And yet another chart which says that according to government reports railroads, industrials and other stocks bring in from 4 to 14 per cent, whereas mining stocks pay 162 per cent! Think of it! That being the end of the exhibit, we turn to go out and are faced with an imposing line of desks each bearing the nameplate of an alert, intelligent looking young man seated behind it. We could not help cursing ourselves for being suspicious of the whole thing. It was a well-conceived and interesting sales effort.

Yet even if the project is honest and the men behind it capable and trustworthy, there is a point in the ethics of such selling that is bad. If we might borrow from P. T. BARNUM, it is a "sucker" appeal which is made. It is not an effort to interest intelligent investors nor to satisfy those who do invest of the soundness of the venture. The casual passerby is lured into the store out of curiosity. A certain percentage of these will by the law of probability have money to invest. Some of them can even be persuaded by Mr. QUICKTURN CAPITAL'S cousins to part with their money by the use of meaningless technical phrases that lend an air of substantiality and by means of glowing pictures of large profits. The cupidity of the investor does not excuse the method. There is no question of legality, but of ethics. For this reason the practice will most probably continue—for it seems to be successful wherever the sky is blue.

Readers' Views and Comments

An Open Forum for Subscribers

The editors invite discussion of articles and editorials in *Chem. & Met.* or on other topics of pertinent interest

"The Modification" of Aluminum-Silicon Alloys

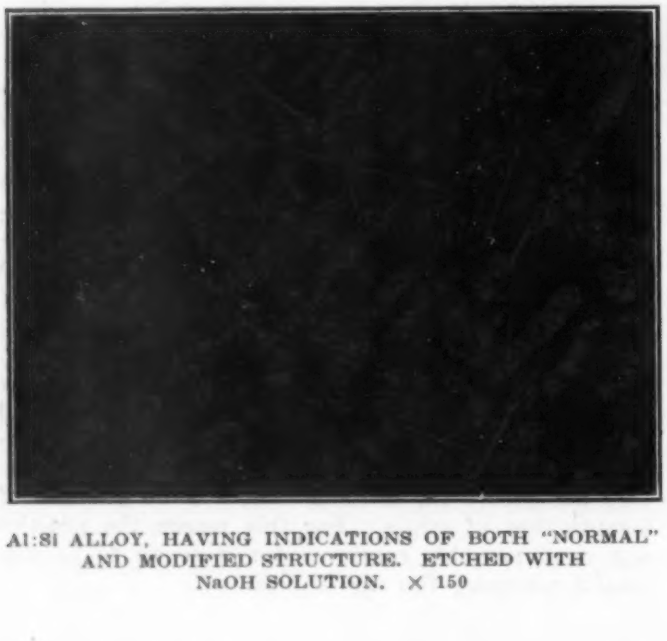
To the Editor of Chemical & Metallurgical Engineering

SIR: — In an article, "'Modification' of Aluminum-Silicon Alloys," by James J. Curran, published in *Chem. & Met.*, Aug. 23, 1922, it is stated that alloys containing from 5 to 10 per cent of silicon "may possess either one of two entirely dissimilar structures."

This opinion is concurred in by the above writer and, as stated, by the writers of three other articles. It is stated that the difference in the two dissimilar structures is due to the presence of sodium in one of them. The photomicrographs and experimental evidence given appear to bear out the above contention. However, no data were given as to the difference in physical properties produced by the addition of sodium, a deficiency supplied later by Dr. Edwards (*Chem. & Met.*, Sept. 27, 1922, p. 654).

While examining an aluminum-silicon casting the writer obtained the accompanying photomicrograph. The composition of the casting was as follows: aluminum 87.09 per cent, copper 0.18 per cent, silicon 10.68 per cent, iron 1.79 per cent, manganese 0.26 per cent. My alloy had a structure like the one described by Jeffries (April 19, 1922), containing 10 per cent silicon and 1 per cent iron, made by direct electrolytic reduction. There is seen the needle-like structure supposed to be obtained in the absence of sodium as well as the structure obtained by the introduction of sodium.

It is possible that the structure shown is a transition stage between the two "dissimilar structures." However, it is probable that the presence of sodium is not sufficient to account for the differences in structure. Small amounts of iron give a needle-like structure (Hoyt, "Metallography," Vol. II, p. 77), which might possibly account for the needles shown. However, with a structure, supposed to be due to the presence of sodium, such needles should not appear, according to Curran's article, since the sample used in his experiment contained 0.70 per cent of iron.



Al:Si ALLOY, HAVING INDICATIONS OF BOTH "NORMAL" AND MODIFIED STRUCTURE. ETCHED WITH NaOH SOLUTION. × 150

The specimen used was repolished and re-etched with NaOH solution. Each time the resulting structure was as shown.

G. W. WALKER.

Chemist, Hupp Motor Car Corp.,
Detroit, Mich.

Mammoth Acid Drain Pipe In Yale's Sterling Laboratory

To the Editor of Chemical & Metallurgical Engineering

SIR:—I have read with considerable interest the very excellent article that appeared in your issue of Feb. 28 on the Sterling Laboratory of Yale University, and while it may seem meticulous to point out any detail so far removed from the casual inspection of this great laboratory as the main acid drain, my attention was attracted by the statement in the article that "a drainage system has been installed entirely of chemical stoneware."

DURIRON 14-IN. RUNNING TRAP FOR STERLING LABORATORY, YALE UNIVERSITY

The fact that the Duriron Co. furnished the main drain pipe and fittings for the Sterling Laboratory is particularly recalled by me, inasmuch as these lines were of 10- and 14-in. size, the largest drain pipe that had been produced in Duriron at that time.

This one detail of the construction problems serves to emphasize the immensity of this building, inasmuch as the main drain pipe from an educational laboratory rarely exceeds 6 in.

The accompanying photograph of one of the Duriron 14-in. fittings will aid in visualizing the scale on which the Sterling Laboratory is built.

THE DURIRON CO., INC.
P. D. SCHENCK, President.

Dayton, Ohio.

Some Research of General Interest in Progress at the Mellon Institute

Outline of Present Status of Investigations Being Conducted in Fellowships Covering Bread, Carbon Dioxide, Coke, Corrosion, Fiber Containers, Gelatine, Insecticides, Insulation, Laundering, Magnesia Products, Mundacizing, Nickel and Monel, Refractories, Vitrified Tile, and Wood Chemicals

BY ALAN G. WIKOFF

TEN years ago the Industrial Fellowship system, formulated by Dr. Robert Kennedy Duncan in 1906, placed in experimental operation at the University of Kansas in January, 1907, and inaugurated at the University of Pittsburgh on March 1, 1911, was established on a permanent basis as the Mellon Institute of Industrial Research. During this first decade, the steady growth of the system has been attended with results of such economic importance to a variety of industries that the fame of the Institute and its work has spread throughout the technical world.

In this connection it is interesting to note that out of 350 Fellowships, 300 have been entirely successful. Of the remainder, 26 were of doubtful success, 11 unsuccessful and 13 were not completed. While in many cases the Fellowships are maintained by a company for its exclusive information, the volume of data which has been made available through publication is really surprising. Indeed, a mere enumeration of the books, bulletins, journal contributions and patents by members of the Institute during the period 1911-1922 forms a pamphlet of 37 pages.[1]

At the present time, 80 Industrial Fellows are conducting research on 50 Fellowships, covering the following subjects:

Asbestos, bread, byproduct recovery, carbon dioxide, chrysotile, cleaning, coke, corrosion, dental alloy, emulsion, flavoring, enameling, esters, fertilizer, fiber, food container, gelatine, glue, heavy chemicals, inks, insecticides, insulation, laundry, magnesia products, medicinals, metallic oxides, metal ware, natural gas, nickel, oil, organic synthesis, perfumes, pharmaceuticals, protected metals, refractories, roofing, salt, silicate, slag, smoke, steel, stove, synthetic acids, synthetic resins, textile finishing, varieties, varnish, vitrified tile and wood chemicals.

The complete list of Fellowships and personnel is given in Table I.

While it is obviously impossible to attempt to present a complete picture of current activities at the Institute, the writer feels that a résumé of some of the research in progress may serve to give a clearer conception of the workings of this great organization. At the same time he doubts whether it is possible to convey by means of the written word even a small measure of the spirit of enthusiasm and co-operation which is at once evident to the visitor at the Institute and which permeates its every undertaking.

Through the courtesy and co-operation of the executive staff and the Fellows themselves, general information regarding recent research on sixteen topics is presented in the following pages. In some cases the earlier status of the work has been outlined in a previous article by Savage.[2]

It will be noted that a number of Fellowships are maintained by associations of manufacturers. This is a phase which is becoming increasingly important, as the Institute thereby renders service to a whole group instead of to an individual, and it is possible to conduct the investigations on a more elaborate scale, because the expense is distributed. Most of the results in association research are of such a nature that they may be published without reservation. In the extension of uses for materials, a type of pioneering which is being carried out on a number of Fellowships, the concerted action which is possible through associations is very helpful.

Contact with the Institute and the Fellow is maintained as a rule by a research advisory committee appointed by the association and consisting of three or four officers of company members who are recognized specialists in the field under study. Through their co-operation, the work is planned and the Fellow supplied with necessary materials and all technological information. As in the case of all Fellowships, progress reports are made weekly to the administration. These are summarized into monthly reports for the information of the donors, followed by annual reports if the Fellowship is extended for more than one year. At the termination of the research a monograph is prepared.

[1]Copies of this list, which is Bibliographic Series, Bulletin 1, may be obtained from the Director, Mellon Institute of Industrial Research, Pittsburgh, Pa.

[2]Wallace Savage, "Industrial Research at the Mellon Institute," *Chem. & Met.*, vol. 22, p. 249, Feb. 11, 1920.

Table I—List of the Industrial Fellowships in Operation at Mellon Institute on March 1, 1923

No.	Names of Industrial Fellowships	Industrial Fellows Names and Degrees	Date of Expiration
181	Synthetic resins	C. B. Carter (Ph.D., University of North Carolina), senior fellow; A. E. Coxe (B.S., University of Chicago)	April 1, 1923
309	Glue	A. M. Howald (Ph.D., University of Pittsburgh)	April 1, 1923
324	Textile	E. R. Clark (B. A., Yale University)	May 1, 1923
326	Enameling	R. D. Cooke (M.S., University of Wisconsin)	April 1, 1923
327	Varnish	Marc Darrin (M.S., University of Washington)	May 1, 1923
328	Steel	B. B. Wescott (Ph.D., University of Pittsburgh)	June 15, 1923
329	Stove	J. E. Hansen (B.S., University of Illinois)	June 22, 1923
330	Bread	H. A. Kohman (Ph.D., University of Kansas), senior fellow; Roy Irvin (M.S., University of Kansas); E. S. Stateler (M.S., University of Pittsburgh)	June 1, 1923
331	Protected metals	J. H. Young (Ph.D., Ohio State University), senior fellow; P. D. Gephart (B.Ch.E., Ohio State University)	June 1, 1923
332	Food container	W. F. Henderson (Ph.D., University of Pittsburgh), senior fellow; H. E. Dietrich (A.B., University of Kansas)	July 12, 1923
333	Corrosion	C. R. Texter (B.S., Pennsylvania State College)	July 1, 1923
334	Gelatine	T. B. Downey (Ph.D., University of Pittsburgh)	Sept. 1, 1923
335	Ester	J. J. Fitzpatrick (B.Chem., University of Pittsburgh)	Aug. 5, 1923
336	Oil	W. F. Faragher (Ph.D., University of Kansas), senior fellow; W. A. Gruse (Ph.D., University of Wisconsin); R. W. Henry (B.S., University of Oklahoma); S. P. Marley (B.S., University of Pittsburgh)	Sept. 1, 1923
337	Metallic oxides	G. E. Seil (Ph.D., University of Pittsburgh)	Sept. 1, 1923
338	Slag	Tracy Bartholomew (E.M., Colorado School of Mines), senior fellow; H. C. Goover (A.B., Ursinus College)	Sept. 21, 1923
339	Gas	J. B. Garner (Ph.D., University of Chicago), senior fellow; Gertrude E. Price (A.B., Goucher College), assistant	Sept. 15, 1923
340	Wood chemicals	R. F. Remler (B.Chem., University of Pittsburgh)	Nov. 1, 1923
341	Perfumes	L. E. Gilson (Phar.B., University of Southern California); E. H. Balz (Ph.D., University of Pittsburgh)	Oct. 1, 1923
343	Pratt	L. H. Cretcher (Ph.D., Yale University), senior fellow; F. W. Hightower (B.A., University of Texas)	Dec. 15, 1923
344	Inks	F. F. Rupert (Ph.D., Massachusetts Institute of Technology)	Nov. 1, 1923
345	Chrysotile	Henry Joseph (Ch.E., Columbia University	Jan 1, 1924
346	Laundry	A. F. Shupp (Ph.D., University of Pittsburgh), senior fellow; Alice L. Wakefield, (B.S., Carnegie Institute of Technology); Mary M. Danley (B.S., Carnegie Institute of Technology)	Nov. 1, 1923
347	Emulsion flavors	Melvin DeGroote (B.Ch.E., Ohio State University)	Nov. 15, 1923
348	Heavy chemicals	E. E. Marbaker (Ph.D., University of Pennsylvania)	Dec. 1, 1923
349	Fiber	M. C. Walsh (Chem.Eng., Columbia University)	Nov. 15, 1923
350	Salt	T. E. Williams (B.S., University of Michigan)	Nov. 1, 1923
351	Nickel	O. B. J. Fraser (B.S., Queen's University, senior fellow; H. E. Searle (B.S., Queen's University)	Dec. 1, 1923
352	Silicate	J. L. Crawford (B.S., University of Illinois)	Dec. 1, 1923
353	Medicinal	C. C. Vogt (Ph.D., Ohio State University)	Jan. 1, 1924
354	Varieties	E. R. Harding (M.A., Leland Stanford University), senior fellow; F. J. Murphy (B.S., University of Pittsburgh)	Jan. 1, 1924
355	Fertilizer	H. H. Meyers (B.S., University of Pennsylvania), senior fellow; W. T. Nichols (B.Chem., University of Pittsburgh)	Jan. 5, 1924
356	Insulation	R. H. Heilman (E.E., University of Pittsburgh)	Jan. 1, 1924
357	Coke	F. W. Sperr, Jr., (B.A., Ohio State University), advisory fellow; W. J. Huff (Ph.D., Yale University); H. W. Rose (B.A., Yankton University); J. A. Shaw (B.S., Pennsylvania State College); G. G. Desy (B.S., Worcester Polytechnic Institute)	Jan. 1, 1924
358	Byproducts	Walther Riddle (Ph.D., University of Heidelberg); H. E. Gill (Ph.D., University of Pittsburgh), assistant	Jan. 1, 1924
359	Insecticides	O. F. Hedenburg (Ph.D., University of Chicago)	Feb. 1, 1924
360	Asbestos	G. H. Katz (B.S., Ohio State University)	Feb. 1, 1924
361	Metal ware	W. G. Imhoff (M.S., University of Pittsburgh)	Feb. 16, 1924
362	Organic synthesis	J. G. Davidson (Ph.D., Columbia University), senior fellow; C. J. Herrly (B.S., Pennsylvania State College); A. R. Cade (M.S., University of Minnesota); J. T. Baldus (B.Chem., University of Pittsburgh), assistant	Jan. 1, 1924
363	Synthetic acids	R. B. Trusler (B.S., Syracuse University)	Feb 1, 1924
364	Dental alloy	J. W. Harsch (B.S., University of Illinois)	March 1, 1924
365	Roofing	E. S. Ross (M.S., New Hampshire College)	Feb. 1, 1924
366	Refractories	M. C. Booze (B.S., University of Illinois), senior fellow; S. M. Phelps (University of Toronto); R. F. Ferguson (B.S., University of Pittsburgh); Jules Labarthe (B.S., University of California); W. R. Kerr (University of Pittsburgh), assistant	March 1, 1924
367	Magnesia products	H. W. Greider (M.S., University of Kansas)	March 1, 1924
368	Pharmaceuticals	A. W. Harvey (Ph.D., University of Pittsburgh)	March 1, 1924
369	Smoke	A. R. Powell (Ph.D., University of Illinois)	March 1, 1924
370	Vitrified tile	H. G. Schurecht (B.S., University of Illinois), senior fellow; G. R. Pole (B.S., University of Washington)	March 1, 1924
371	Vitrified tile	H. G. Schurecht (B.S., University of Illinois), senior fellow; G. R. Pole (B.S., University of Washington)	March 1, 1924
372	Cleaning	L. E. Jackson (B.S., University of Kansas), senior fellow; Helen E. Wassell (B.S., Carnegie Institute of Technology)	March 1, 1924

At present, the following Industrial Fellowships are maintained by associations of manufacturers:

Name	Company-Members in Association
Carbon dioxide	7
Edible gelatine	7
Fiber	25
Insecticides	5
Laundry	2066
Magnesia products	2
Metal ware	15
Mundacizing	10
Refractories	90
Stove	15
Vitrified tile	44
Wood chemicals	68

Vitaminous Bread

Henry A. Kohman, Roy Irvin and E. S. Stateler, on the Bread Fellowship, have been aiding the Ward Baking Co. laboratories in developing a bread, now on the market, which is a complete food.

By feeding tests on laboratory animals using the best white breads obtainable by the usual methods of manufacture, it was ascertained that, as exclusive articles of diet, these breads could not provide either growth or increase in body weight and that the animals under observation could not exist on bread alone. Whole wheat bread was also found deficient. With the addition of vitamines and mineral salts from wheat germ and bran, the animals under test showed improved condition and better development, although they still did not reveal normal growth. It then developed that the proteins in the bread were not properly balanced and that milk proteins were needed. Making the bread with milk instead of water and adding extra milk solids solved this particular problem. Addition of the new wheat germ extract was also necessary in order to balance the mineral salts. Indeed, the addition of many substances was tried and by eliminating all non-essentials and retaining the necessary and vital substances, the growth of the experimental animals was improved step by step.

Finally there resulted a bread on which the animals under observation grew to maturity and remained in a healthy condition. More important still, these animals were able to reproduce and rear their young, which had not been possible with previous breads. As many as six generations of animals have been raised on this new bread as the sole source of food, only city water being supplied in addition to the bread in all the concluding animal tests.

In making this new bread, which is already on the market in a number of cities, the vitamines and mineral salts recovered from the byproducts from milling wheat are restored to the white flour, and, with the additional vitamines and proteins provided by the use of rich whole milk, without any water whatever, a loaf of bread is produced which is a balanced food, complete in itself.

This work presents an almost ideal answer to the oft-repeated question, "Does research pay?" since one of the factors essential to successful research—benefit to the public as a whole—is more clearly evident than in the average instance.

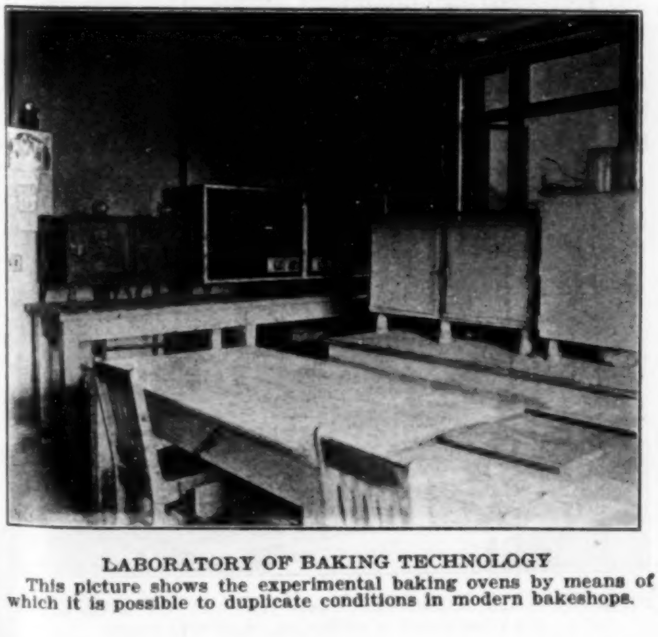
Uses for Carbon Dioxide

For the purpose of classifying, investigating and extending the uses of carbon dioxide, particularly liquid carbon dioxide, the Liquid Carbon Dioxide Division of the Compressed Gas Manufacturers' Association has established an individual Fellowship, C. L. Jones being the present incumbent. Data of unusual interest have been accumulated, some of which will be treated in more detail in an article on the uses of liquid carbon dioxide to be published in a subsequent issue. Mr. Jones is now according research attention to the use of liquid carbon dioxide in extinguishing mine and electrical fires.

Coke Fellowship

Although only five names appear under the multiple Industrial Fellowship on coke, the Koppers Co., which maintains the Fellowship, has a chemical research force which averaged about twenty members for the year 1922. F. W. Sperr, Jr., chief chemist of the Koppers Co., is senior advisory Fellow.

Owing to the wide interests of this organization, the Fellowship activities may be divided into two classes: Research problems; and necessary testing work required for the construction of byproduct coke and gas-oven



LABORATORY OF BAKING TECHNOLOGY
This picture shows the experimental baking ovens by means of which it is possible to duplicate conditions in modern bakeshops.

plants with complete byproduct recovery, and tar-distilling and liquid purification plants. This testing work also includes the examination of coals for yield and nature of coke and byproducts, to be used as basis of plant guarantees; the examination of tars, etc.

In regard to the research problems, the most noticeable recent accomplishment has been the commercial development of the liquid purification process for removal of hydrogen sulphide and also hydrogen cyanide from the gas. Over twenty liquid purification plants are in operation or under construction, and the process is also being exploited in foreign countries. A plant is being started at the present time in England.

Purification of ammonia-still waste is rapidly becoming necessary for many plants and methods for carrying out this purification have been developed through research.

Another important line of investigation has been the study of coke from the standpoint of physical characteristics, with special reference to its performance in the blast furnace. Of most immediate interest is the combustibility of coke.

These three phases—gas purification, ammonia-still waste purification, and study of coke—are the most important lines of investigation in progress at the present time and work will be continued thereon during the coming year.

The investigation of new uses for byproducts from coke plants is always under consideration. This is especially true of coke-oven tar and light-oil products.

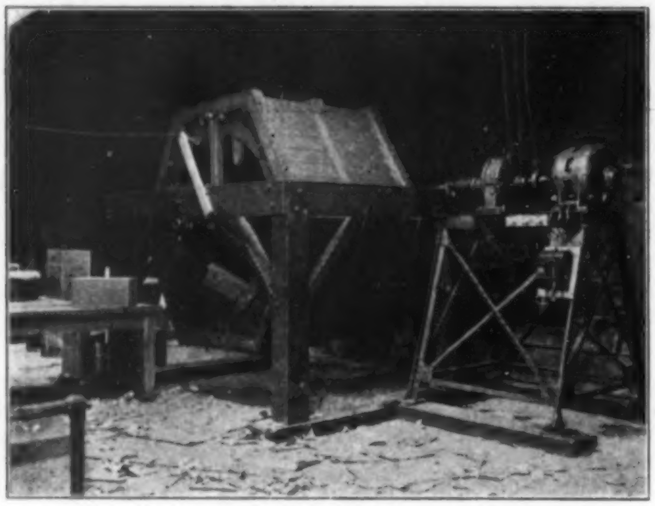
The various members of the organization have over eighty United States and foreign patents issued or favorably acted upon, covering various phases of the work. Among the research accomplishments of the past (mostly during the period of the war) are the recovery of benzene and toluene from carburetted water gas, the manufacture of coumarone and other resins, and motor fuels.

Corrosion

One of the well-known manufacturers of steel pipe is the donor of a Fellowship on corrosion, the work of which is being carried on by C. R. Texter. This Fellowship is devoted to a study of the effect of different kinds of water upon the internal corrosion of pipe lines, and of practical means for the prevention thereof. It has been found that, in natural waters, one of the most important factors influencing the corrosion of steel and iron pipes in hot water supply systems, boiler economizer tubes, etc., is the amount of oxygen carried in solution by the water. Another large factor is the chemical composition of the water itself, upon which depends the tendency of the water to form or not to form a self-healing protective film upon the surface of metal containing the water. This question is being investigated in a practical way upon as many different waters as possible.

Increasing the Service Rendered by Fiber Containers

Within recent years the partial replacement of wooden boxes and crates by fiber containers has become increasingly important. In addition to such advantages as lower first cost and reduced shipping weight, the use of the fiber products aids in conserving a natural resource which is being depleted at an alarming rate. Much of the progress toward the present highly satisfactory container is the result of investigational work



DRUM TESTER
Used in the tests made by the Industrial Fellowship maintained by the Container Club, an association of manufacturers of solid and corrugated fiber boxes.

conducted under the Fellowship maintained by the Container Club, an association of corrugated and solid fiber box manufacturers. Standardization and improvement of raw materials, manufacturing processes and finished products have been the aims of this work, which is at present carried out by Maurice C. Walsh.

Some of this work was summarized in the previous report.[3] For the purpose of determining resistance to handling and rough usage, there has since been installed a revolving 7-ft. hexagonal drum with various baffles, in which the containers receive in a brief period more severe treatment than would result from a transcontinental shipment. This drum has been of immense utility in determining the values of different box designs and the worth of proposed improvements and changes.

Recently a series of 500 fiber cases, consisting of 5-case lots of each product which a prominent food manufacturer packs in glass, was run in the drum tester to the point of breakage of the first bottle. Physical tests of the bottles were also made in four different ways and it was shown in a hearing before the Interstate Commerce Commission that there is no relation between the fragility of glass bottles and breakage in shipment when packed in fiber containers.

Stacking qualities of the boxes are determined by hydraulic-press tests, and it is interesting to note that fiber boxes have now been developed which will stand, when empty, a pressure of over one ton without collapsing.

Service facilities of the laboratory are available without charge to the general public for the benefit of the industry and a great deal of the work is done for shippers and manufacturers not members of the Container Club. A report on work done is made every 2 months at the meetings of the Container Club, and frequent visits are made to plants of box manufacturers and shippers, so that their problems may be studied at first hand.

Determining the Food Value of Edible Gelatine

Thorough investigation of the food value of edible gelatine is being conducted by T. B. Downey, in a Fellowship established by the Edible Gelatine Manufacturers of America, Inc. Through feeding experiments on albino rats, an effort is being made to get definite information on the real food value of gelatine as well as its supplementary action when used in conjunction with other food products. Its uses in confectionery and in ice cream present specific problems to be studied. In the case of milk it has been found that gelatine acts as a protective colloid, preventing the development of hard curds, and thus making the milk easier to digest. Gelatine functions in a similar way to make ice cream easier to digest, in addition to acting as a stabilizer. Dr. Downey has completed arrangements with medical specialists for thorough study of gelatine in infant feeding.

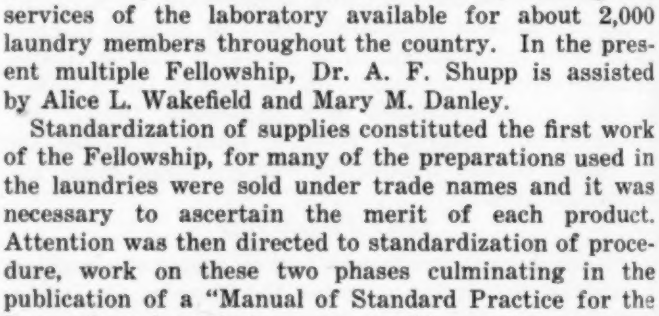
Enthusiastic personal interest in the progress of the work is taken by the donor of the Fellowship. It has been determined to establish and to make public the true facts as to just what gelatine does in all of its present uses and just what is its real food value.

Research and the Power Laundry

In 1914 a small group of Pittsburgh laundry owners, realizing that they were beset by technical problems beyond the comprehension of laymen and that the then recently organized Mellon Institute was equipped to solve them, established an Industrial Fellowship for the investigation of problems in laundering. About 18 months later the financial obligations were assumed by the Laundryowners National Association, making the services of the laboratory available for about 2,000 laundry members throughout the country. In the present multiple Fellowship, Dr. A. F. Shupp is assisted by Alice L. Wakefield and Mary M. Danley.

Standardization of supplies constituted the first work of the Fellowship, for many of the preparations used in the laundries were sold under trade names and it was necessary to ascertain the merit of each product. Attention was then directed to standardization of procedure, work on these two phases culminating in the publication of a "Manual of Standard Practice for the Power Laundry Washroom." In this treatise standard formulas for washing all types of fabrics are given, together with discussions of water, soap, soda and other supplies. Before making these recommendations, the possibility of disease being spread through laundries was carefully considered. Bacteriological tests showed that a treatment at least 20 minutes at a temperature between 140 and 160 deg. F. destroys all pathogenic non-spore-bearing organisms, while the dry rooms, tumblers and ironing process complete the sterilization.

During the past year the question of low-titer versus high-titer soaps has been under consideration. It has been shown that solutions of high-titer soaps exhibit lowest surface tension at about 140 deg. F., while the



VIEW IN MAIN RESEARCH LABORATORY OF THE LAUNDRYOWNERS NATIONAL ASSOCIATION

[3]See footnote 2.

corresponding temperature for low-titer soaps is around 90 deg. F. Since maximum emulsifying power obtains at the point of minimum surface tension, this would indicate that low-titer soaps should be more efficient for washing in cold or lukewarm water.

Although standard procedures have been worked out, it must be remembered that it is not possible for the laundry to standardize the goods which are sent to it. Adjustment of claims for damage is an important item in laundry management and studies of this phase soon developed the interesting fact that in many cases the fabric itself and not the laundry was at fault. While only four fibers are in general use—cotton, linen, wool and silk—improper manipulation during spinning, weaving, bleaching, dyeing, etc., often introduces defects which may not be evident until the finished goods are wet or washed, when they disintegrate or distort in a manner which would seem to indicate very rough treatment by the laundry. For instance, cloth may be finished and dried with some of the threads under greater tension than others. As long as the goods remain dry, they appear satisfactory; but when wet, the threads assume a normal tension and the piece shrinks unevenly or gets completely out of shape. Other examples were given in the previous article.

This aspect of the work has become so important that the entire time of one of the incumbents is devoted to it. It is realized that the solution of these problems lies in educating the buyers of textiles to discriminate between the well-made product of a reputable manufacturer and the clever but inferior imitation which often brings a higher price. This is an undertaking of considerable magnitude, but an excellent start has been made through the publication of a treatise on "The Conservation of Textiles," in which, for the first time, the faults of textiles are discussed in detail. It also includes a plea for a pure fabric law. The interest and co-operation of many of the larger textile mills have been secured and it is planned by the Laundryowners National Association to carry on the campaign through distribution to the public of a series of educational leaflets covering the selection and care of textile products.

Insecticides

As noted in the previous article,[4] important research on the manufacture of lead arsenate and calcium arsenate has been conducted by Dr. Oscar F. Hedenburg, Industrial Fellow for the Rex Spray Companies, an association of manufacturers of insecticides of all types. More recently there has been developed through this research work a new and valuable household insecticide which is very effective against flies, mosquitoes, moths and other insect pests. This new material, "Fly-Tox," is a clear, amber-colored liquid of a pleasing odor and is applied by spraying.

[4]See footnote 2.

Heat Insulation

Until the present Industrial Fellowship year the work on heat insulation was supported by the Magnesia Association of America. By special arrangement the association gave permission to the present donor—an individual manufacturer of heat-insulating materials—to subsidize the investigations.

At the present time, R. H. Heilman is conducting a series of tests for the purpose of determining the merits of insulations for superheated steam and of developing new coverings to keep pace with the growing demand for higher pressures and superheat.

The electrical method of testing is employed in the laboratory and pipes of various sizes are used in order to derive formulas whereby the losses from pipes of any size and operating under any condition of steam pressure can be readily and accurately calculated.

Many tests are being conducted in the laboratory to determine the thermal conductivity of various insulations and the laboratory tests are frequently checked by field tests, so as to obtain not only the thermal efficiency of the coverings but also their practicability as heat insulators under actual operating conditions.

For a paper entitled "Heat Losses From Bare and Covered Wrought Iron Pipe at Temperatures up to 800 Deg. F.,"[5] presented before the American Society of Mechanical Engineers in 1922, Mr. Heilman was awarded one of the society's junior prizes.

New Uses for Light Magnesium Carbonate

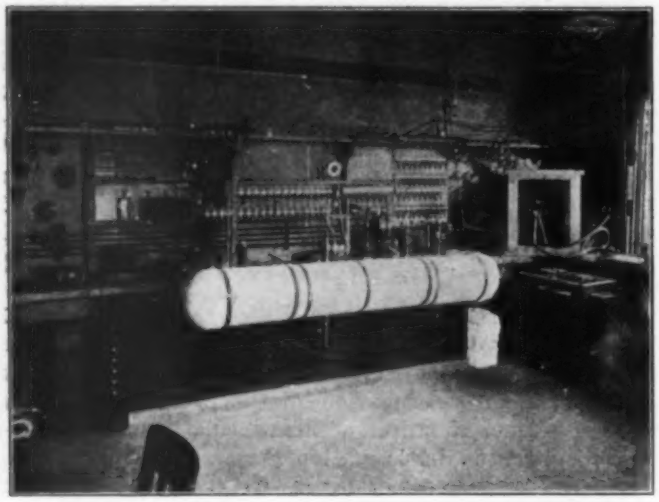
Light magnesium carbonate, the chemically precipitated basic hydrated carbonate of magnesium, possesses properties which would indicate the possibility of extending some of the present applications and of developing new ones, while modification of certain physical properties would make it better adapted for

[5]Abstracted in *Chem. & Met.*, vol. 27, p. 63, July 12, 1922, *Mechanical Engineering*, vol. 44, p. 435, July, 1922.




EXECUTIVE STAFF

Edward R. Weidlein — William A. Hamor — E. Ward Tillotson — Harry S. Coleman



MAGNESIA INSULATED FELLOWSHIP LABORATORY

many uses. This, in brief, is the purpose of the magnesia products Fellowship, maintained by two prominent manufacturers of this material.

Convinced by a preliminary survey that the rubber industry afforded one of the most promising fields, H. W. Greider made a study of some physical properties of rubber compounded with light magnesium carbonate and with other pigments. The magnesium carbonate was found to act as a typical reinforcing pigment, increasing the tensile strength, hardness, stiffness and resilient-energy capacity of the compounded rubber. Only gas black exceeds it in reinforcing power. However, owing to the crystalline character of the present product, it tends to give a high permanent set, which is not generally desired. Work in progress includes a study of particle size with the object of increasing the uniformity while decreasing the size of the particles and also of increasing the ease of dispersion in rubber and other materials in which it is used as a filler.

Abrasion resistance is another property of vulcanized rubber which has received careful attention. In this connection it is interesting to note that the eminent English authority Dr. Philip Schidrowitz, commenting in the *India Rubber Journal*[a] on Mr. Greider's report entitled "The Resilient Energy and Abrasion Resistance of Vulcanized Rubber," says that as a whole it "is a notable contribution to the literature of the subject."

Reducing Losses in Galvanizing

Many problems of economic importance to the galvanizing industry are being studied by Wallace G. Imhoff on the Fellowship maintained by a group of sheet metal ware manufacturers. The work is planned to aid the industry in producing goods of higher quality and also in developing economies in practice.

The principal loss of zinc in galvanizing results from the formation of dross, zinc ashes or sal ammoniac flux skimmings. Any reduction which can be made in this loss will have a direct effect upon the cost of production. When, for example, it is considered that every 5 lb. of iron that enters the bath will render unavailable 95 lb. of zinc, the importance of the possible savings will be readily appreciated.

Spent pickle is another byproduct that is receiving attention, with a view to possible recovery or utilization. The whole subject of pickling has been studied systematically in order to determine the pickling time and the method of handling which will give the maximum efficiency for different classes of ware.

Similar studies on the galvanizing operation itself have been conducted to develop the best coating for the purpose intended; in other words, to get the right coating in the right place.

Engineering recommendations covering such topics as most economical design for galvanizing plants, comparative values of different fuels, and kettle design also form an important part of the service which is being rendered by this Fellowship.

Mundacizing

For several years a multiple Industrial Fellowship on dry cleaning has been maintained by the International Technical Society of Cleaners and Dyers, an organization of nine of the largest and most progressive firms in the business. Recently it was desired to adopt a name which would better express the action of cleaning both dry and wet, and at the suggestion of W. A. Hamor, the Latin *mundo*, to rehabilitate, was chosen as the root for a series of new terms. Thus, the society becomes the Mundatechnical Society of America, the technical men in the industry are mundatechnologists, the master cleaners are mundicians, the operation of cleaning will be known as mundacizing, etc. Cleaning is thus differentiated from laundering.

Lloyd E. Jackson and Helen E. Wassell have obtained some very interesting results in studying the problems confronting the cleaning or mundacizing industry. As in the case of the laundry work, it was first necessary to establish specifications for dry-cleaners' soap, cleaners' naphtha and benzol. Motor gasoline is not satisfactory, as the light portions result in high evaporation loss, high-boiling fractions remain in the goods, and unsaturates give odors difficult to remove.

In a plant of any size the investment in gasoline or benzol is a considerable item, and the recovery of the solvents in a condition for re-use is consequently a problem of importance. It can be accomplished by distillation, of course, but work in progress on this Fellowship indicates the possibility of economically removing dirt and color by suitable chemical treatment.

Rendering garments mothproof at the same time that they are mundated is another phase of the investigations which offers attractive possibilities. It has already been determined that mundacizing is very efficient in destroying bacteria and larvæ.

Since gasoline or benzol is the only solvent used, there are frequently found on mundacized garments stains which require for their removal treatment with other solvents or agents. Many special problems arise and the laboratory is frequently consulted regarding the best procedures for removing particularly obstinate spots and for renovating unusual goods.

Nickel and Monel Metal

Certain mysterious failures of Monel metal tie-rods, pins, etc., in pickling tanks led to the establishment of a multiple Fellowship for the purpose of investigating the cause. Corrosion was found to be the result of a concentration-cell effect set up between points at which the pickle had penetrated the wood and was in contact with the metal as a stagnant solution and other points where the metal was exposed to a free wash of solution, as at cracks. The subject of atmospheric corrosion was next taken up, and this is being continued

[a]Vol. 64, page 845, Nov. 18, 1922.

by the present incumbents, O. B. J. Fraser and H. E. Searle. Projected uses for both Monel and nickel are also being studied. Pickling equipment, valves in superheated steam lines, dyeing, laundry and dairy machinery, hospital equipment, equipment for cafeterias and restaurants, meat slicers, drying screens for glue and gelatine, filter cloth and a variety of chemical engineering apparatus may be mentioned as some of the typical uses for Monel. Plugs for Burton-process stills are being made from cast Monel.

Refractories

The matter of tests for refractory materials and products has been the basis of a considerable portion of the work carried on at the Mellon Institute of Industrial Research by the multiple Fellowship established by the Refractories Manufacturers Association.

The test for spalling or disintegration under abrupt temperature changes has required the accumulation of a large amount of data, in order that the test, as finally used, may be applicable in a practical way.

A new test for determining the action of various slags or fluxes upon refractories has been evolved. This in conjunction with tests previously in use makes possible the obtaining of definite results.

A furnace has been developed for the hot crushing of highly refractory specimens, in which very high temperatures may be maintained while the specimens are under extreme loads. Four tests may be run at one time. It has proved to be valuable in the development of bonds for chromium and magnesite refractories and in research on silica brick.

All other standard tests are made upon refractories in addition to those named, many of them being made in such large number that excellent practice has been established.

Special tests have been applied from time to time for comparative purposes. These have been particularly valuable in the accumulation of data on the unstudied physical and chemical properties of refractories.

The application of these tests has resulted in a decided improvement in the quality of refractory products. The manufacturers have recognized the value of work carried on in a well-organized laboratory and have employed it very fully in control of the quality of their products as well as in the development of new products and in the bettering of their manufacturing methods.

The true value of such work to the manufacturers and consumers of refractories can be appreciated only when it is realized that the product is ordinarily made from naturally occurring materials which are heterogeneous mixtures and often vary to the extreme. Without control tests, a deficiency in the product is not recognized until failure occurs in a furnace wall.

VIEW IN ONE OF THE LABORATORIES OF FELLOWSHIP SUPPORTED BY METAL WARE MANUFACTURERS

This picture shows an experimental gas-fired galvanizing kettle in which all the operations of galvanizing are duplicated on a small scale. This is a typical illustration of hot galvanizing, or pot galvanizing.

A number of failures of refractories have been investigated and the data gathered have led to better practice in furnace construction. A notable example is the investigation of various refractory cements on the market. This has resulted in an educational campaign against the use of cements of poor quality and has produced gratifying results.

With the development of tests covering the various properties of refractories has come the tendency to specialize. It is no longer common for a manufacturer to supply one or two classes of product for a great variety of uses. On the contrary, the particular requirements of a consumer are now met by a product designed to meet his needs. The economies of such practice are readily apparent.

Problems in the Manufacture of Vitrified Tile

Two associations of manufacturers of vitrified tile, the Clay Products Association and the Eastern Clay Products Association, jointly maintain a multiple Fellowship for the purpose of improving their product. Problems at present under investigation by H. G. Schurecht and G. R. Pole fall into three groups: Removal of iron-bearing minerals from the clays; glazing, and heat distribution in kilns.

Iron produces small dark lumps on the surface of the tile, so that a rough surface is presented by the interior of the pipe instead of the desired smooth finish. Elimination of iron will also reduce manufacturing losses and improve the appearance and glaze of the ware.

Relation between composition of clays and their ability to take salt glaze has been established by making a series of clay test-bars with variable amounts of the constituent under study. These were then fired and salt-glazed along with regular ware in a commercial kiln. A highly siliceous lime-free body seems to give the best results. The work is being extended to determine the influence of magnesium, potassium and sodium.

Since more uniform strength of ware as well as economy in fuel would result from more even distribution of heat in the kilns, a study of this factor is being undertaken for the various types of kiln and designs of flues in common use.

That such a commonplace commodity as drain tile should present problems for research quite as attractive as any in more highly developed fields may come as a surprise to many, but it is a fact that it has been found to be rich in opportunities of economic importance.

Extending the Uses for Wood Chemicals

About sixty-eight companies, manufacturers of methanol, calcium acetate and charcoal, comprising the National Wood Chemical Association, maintain a Fellowship, on which R. F. Remler has been studying the commercial applications of acetone and methanol.

During the past year Mr. Remler completed an investigation of the solvent properties of acetone. Solubility data were obtained for the following classes of materials: Oils, fats and greases, mineral lubricating oils; asphalts and bitumens; essential oils; rosin, copal

resins, coumarone resins; water gums; shellacs; waxes; cellulose acetate and cellulose nitrate. These results show its efficiency as an industrial solvent. Owing to the low boiling point, when used for extraction purposes the fuel cost is low and there is less danger of decomposing the final product than when higher boiling-point solvents are employed. Frequently, where used as a lacquer or varnish solvent, the vapors of acetone can be recovered by absorption, followed by fractional distillation. Acetone is less flammable than benzene, toluene ethyl ether, petroleum ether, gasoline or pentane. It is completely miscible with water and with many other solvents. A homogeneous liquid can be produced in some instances by the addition of a small amount of acetone to two immiscible solvents.

Work has also been done on acetone as a motor fuel. Some of the results may be summarized as follows:

Acetone alone is an excellent fuel, easy to start, does not freeze at the coldest winter temperature, and will not detonate under 180-lb. pressure. It is not only miscible in all proportions with the various fuels used in motor cars, but produces a uniform mixture where added in various amounts to a number of immiscible liquids. Where added in small amounts to high-hydrocarbon fuels, it minimizes the deposition of carbon and prevents "fuel knocks." Actone is the most economical solvent for acetylene, and, if saturated with this gas and added to composite motor fuels, produces a smoother running mixture, facilitates starting, and permits operating on a leaner mixture.

A study of the action of acetone and methanol on various metals is now in progress.

Mr. Remler is prepared to serve as a clearing house of general information concerning products of wood distillation and to furnish advice regarding industrial applications of acetone, methanol, and acetic acid. He has collected all facts reported in the literature and this information is available to anyone interested in the subject.

Hazards in Gas Compression

Temperature Control Through Proper Lubrication and Cooling Is Essential—Different Gases Require Special Precautions

APPLICATION of the principles of safety engineering to problems of gas compression is discussed by A. D. Risteen in the April, 1923, number of *Mechanical Engineering*.

The outstanding factor in safe compression is temperature. This must be carefully controlled in the case of every gas through proper lubrication of the cylinder of the compressor and by cooling this cylinder by proper circulation of cold water in the jacket. Intercoolers in cases where several stages are employed are likewise essential.

For explosive gases such as hydrogen, valves on the compressor should be locked to prevent leakage. The precaution of removing every possible source of ignition is general. Wiring should be inclosed, switches and fuses placed at a distance; all bulbs should be inclosed in vapor-proof globes; no motors should be running in proximity to any place where gas may escape. Ample ventilation of rooms where gas is handled is of the utmost importance. Ease of exit must also be provided. In the cases of various common gases certain specific precautions become necessary.

In compressing air, water rather than oil should be used as a lubricant wherever high pressures are to be obtained. If oil is used on lower stages, the quantity and quality must be very carefully regulated. Removal of excess oil accumulated in receiver, piping or discharge valves must be provided for.

Oxygen must be absolutely free from combustible impurities at the time of compression and must be stored in strictly clean containers. Presence of grease, oil, organic dirt or red lead involves an extreme hazard. Water must be used in lubricating compressor.

Explosion through leakage is the chief danger in handling hydrogen. Admixture of oxygen makes the gas very unstable. Small amounts of oxygen may be removed by palladium pumice.

Nitrogen, argon, carbon dioxide and similar inert gases require comparatively few precautions. The toxic effect of CO_2 must be guarded against. Usually N is required free from hydrocarbons. This requires water lubrication.

Common Gases Cause Trouble

Chlorine is easy to see and its odor is readily recognized. Cooling caused by expansion of the gas in case of an explosion causes so much chilling that gas is dispersed only slowly. To prevent corrosion of containers, this gas must be absolutely dry. This drying may be effected in towers packed with pumice wet with concentrated sulphuric acid. The chief difficulty in compression is maintenance of gas-tight apparatus. Special packings of alternate hard and soft rings may be used. Compressed chlorine should be stored in clean cylinders to avoid hazard of chemical combination with foreign substances which might be present.

Since heat is absorbed when acetylene is formed, this gas is unstable under many conditions. The piston should move at low speed to avoid heating, and several stages should be employed. Apparently acetylene becomes unstable on standing, especially at high pressures. This gas should not be stored in an otherwise empty cylinder at a pressure over 30 lb. per sq.in. absolute. To store acetylene safely the compressed gas is dissolved in acetone. Cylinders used for this gas must never be used for any other purpose.

Ammonia Forms Explosive Mixtures

Contrary to the usual assumption that ammonia gas is not explosive, it has been found that an air mixture containing 16 to 27 per cent ammonia can be exploded. For this reason arc lights or other means of ignition should be guarded against wherever the concentration of ammonia gas may build up. Because of its solubility in water, a sprinkler system is recommended as a means of reducing its effect in case of an emergency. The compression of ammonia involves another source of danger. If the gas is allowed to become unduly hot during the process, a readily combustible gas is formed. Decomposed oil presumably forms part of this gas. The ammonia itself dissociates somewhat into its components. To avoid the danger of explosion during compression it is necessary to use a special lubricant and to keep the gas cool during the process.

A safety valve on compressing apparatus is recommended as a means of relief in case of trouble. To avoid danger of release of gas into surrounding atmosphere it is recommended that the safety valve discharge be into the low-pressure main or outside the building.

Distribution of Sulphur in Petroleum Products*

Particularly With Reference to the Primary Products Resulting From Cracking Distillation of a Hydrocarbon Oil—Found to Be Closely Analogous to Distribution of Nitrogen in Destructive Distillation of Shale Oil

BY GUSTAV EGLOFF AND JACQUE C. MORRELL
Research Laboratories, Universal Oil Products Co., Chicago, Ill.

CRUDE petroleum and the commercial cuts distilled from this substance as a general rule contain some sulphur. The forms into which this sulphur occurs may be briefly summed up as follows:

(*a*) Free sulphur.

(*b*) Hydrogen sulphide.

(*c*) Organic sulphur compounds.

Separation and identity of the last-named class of compounds is a very difficult problem. However, the following classes of compounds have been found in crude petroleum or its distillates:

Thiophenes[1], hydrothiophenes[2], sulphonic acids[3], alkyl sulphates[4], alkyl sulphides or thioethers[5], and mercaptans, or alkyl hydrosulphides[6]. The last two classes of compounds can be looked upon structurally as hydrogen sulphide or hydrosulphuric acid, in which either both hydrogens or one hydrogen has been replaced by alkyl groups.

SOME OF ITS DELETERIOUS EFFECTS

The presence of sulphur in the various commercial cuts of petroleum has a marked bearing upon the use to which these products may be put. In gasoline or motor fuel the presence of sulphur, either in the elementary form or as certain of its compounds, affects the metallic parts of the internal combustion engine in such a way as to cause serious damage, especially where the percentage is very high. In burning oils, such as kerosene, the presence of sulphur compounds beyond a certain limit is objectionable because of the bad odors produced by the use of these oils. Lubricating oils containing a high percentage of sulphur are also apt to have their usefulness impaired by the presence of sulphur or its compounds which might cause corrosive action.

In the cracking of various types of oil for the production of gasoline, the problem of the distribution of sulphur in the primary products of cracking is a very important one. The use of a charging stock with a high content of sulphur is apt to give a motor fuel which may defy treatment for the removal of sulphur compounds or the reduction of the amount present.

No work as yet has been published upon the distribution of sulphur in such cracked products, and it is with this end in view that this investigation is undertaken.

Beilby[7] has carried out some very interesting experiments with regard to the distribution of nitrogen in the various products resulting from the destructive distillation of nitrogenous organic material. He finds that albumin, gelatine and corresponding vegetable matter yield on thermal distillation: (1) ammonia, (2) oil rich in alkaloidal bodies, (3) carbonaceous residue containing a large proportion of the original nitrogen.

When more or less altered deposits of peat, coal, shale, etc., are distilled, a similar redistribution of the nitrogen takes place. A distribution of the nitrogen in shale is shown after distillation as follows:

	Per Cent of Nitrogen
Ammonia and water distillate	17.0
Oils as alkaloidal tar	20.4
Coke residue	62.6

Beilby showed that the nitrogen in the shale upon retorting distributes itself with a higher percentage in the higher boiling point fractions, reaching a maximum in the residue. Further redistillation of the tar into ten fractions also indicates a distribution of nitrogen as shown above—that is, higher percentages in the higher boiling point fractions, reaching a maximum in the residue. The formation of ammonia is a function of the conditions of temperature, time, retort and other factors. Slow distillation results in a decomposition of the alkaloids, producing more ammonia. For example, the total nitrogen in the shale was 0.7 per cent and redistribution took place in the following manner, calculating on a basis of total nitrogen as 100:

	Per Cent of Nitrogen
Ammonia (in water distillate)	32.8
Alkaloids (in oil)	20.0
Coke (N_2)	45.7
Loss	1.5

The work of Bielby indicates, therefore, that the nitrogen present in the original bituminous material increases in the latter fractions during retorting, reaching a maximum in the residue, and furthermore that during distillation of the shale only the more volatile alkaloids come off, and that the residue still contains the less volatile or pitchy nitrogenous bodies. It is probable that there is a series of unbroken continuity from the volatile alkaloids up to pitchy or cokelike nitrogenous bodies.

Perkins[8] has shown that, in working with an American and a Canadian crude oil, when distilled under atmospheric pressure, the percentage of sulphur increases as a function of increasing boiling point fractions. Some of his results are summarized in Table I.

It may be mentioned here that the finding of the present investigation regarding the distribution of sulphur in the primary products from the cracking of oils is closely analogous to the work of Beilby, with regard

[1]Edeleanu and Filiti, *Bull. Soc. Chem., Series* 3, vol. 23, p. 384 (1900).

[2]Mabery, *J. Soc. Chem., Ind.*, vol. 19, p. 508 (1900).

[3]*Veith Dingl. Pol. J.*, vol. 277, p. 567 (1890).

[4]Heusler and Dennstedt, *Z. angew. Chem.*, vol. 17, p. 264 (1904).

[5]Mabery and Smith, *Am. Chem. J.*, vol. 13, p. 232 (1888).

[6]Höfer, "Erdöl," 2nd Edition, p. 82 (1906).

[7]*J. Soc. Chem. Ind.*, vol. 3, p. 216, (1884). See also Morrell and Egloff, *Chem. & Met.*, vol. 19, No. 2, pp. 90-96.

[8]*J. Inst. Petroleum Tech.*, vol. 3, p. 239 (1917).

TABLE I—SULPHUR CONTENT OF FRACTIONS OF AN AMERICAN CRUDE OIL, ORIGINALLY CONTAINING 0.727 PER CENT S

Fraction, Deg. C.	Per Cent of Sulphur	Specific Gravity
To 90	0.02	......
110-150	0.10	0.7282
152-220	0.38	0.7669
220-257	0.41	0.7940
257-300	0.37	0.8138
300-350	0.37	0.8242
Residue	0.54	0.8976

to the distribution of nitrogen in the destructive distillation of organic bodies containing nitrogen.

The starting materials in this work were the primary products resulting from the cracking of a Mexican gas oil by the continuous liquid-gas phase process covered by the Dubbs patents. The quantity of oil operated upon and that of the primary products is shown in Table II and the principal characteristics of these materials will be found in Table III.

The oil was cracked under a pressure of 120 lb. with a liquid transfer temperature of 800 deg. F.

Methods of Determining Sulphur

A great variety of analytical methods exist for the determination of sulphur in petroleum products. Each of these methods has its particular virtues and drawbacks. Although in general by most of the methods reasonable checks may be obtained, the variation in results using different methods is very great.

With the exception of the determination of sulphur in the uncondensible gas the four methods used in the present investigation were as follows:

(1) The lamp method for the determination of sulphur in pressure distillate.

(2) Nitric acid oxidation method, usually known as the Rothe method.

(3) Sodium peroxide bomb method.

(4) The oxygen bomb calorimeter method.

In the determination of the sulphur in the uncondensible gases the usual procedure of determining hydrogen sulphide and carbon dioxide was carried out. A modification of the Burrell apparatus for gas analysis was used, the amount of gas absorbed in sodium hydroxide being taken as the sum of the percentage volumes of carbon dioxide and hydrogen sulphide. The sum of these substances averaged 8.0 per cent. The average carbon-dioxide percentages in a large number of analyses of the uncondensible gas from various types of charging stocks containing no hydrogen sulphide was less than 1 per cent. This would give by difference a volume of hydrogen sulphide equal to 7.0 per cent.

The percentage of hydrogen sulphide given above is only an estimate, although the probable error is very small. However, in order to obtain the true percentage a method was devised whereby the gases were drawn through an absorption bulb containing a solution of approximately normal cadmium chloride. The hydrogen sulphide was absorbed by this solution, with the resulting precipitation of cadmium sulphide. The increase in weight of the bulb is assumed to be the weight of the

TABLE II—MATERIAL AND PRODUCTS INVESTIGATED

	Quantity	Bé. Gr.	Sp.Gr.	Weight of Total In Lb.
Charging Stock:				
Mexican gas oil	1,966 bbl.	26.2	0.8973	617,225
Pressure distillate	1,004 bbl.	44.8	0.8026	289,609
Residuum	855 bbl.	17.4	0.9503	284,299
Coke	6,795 lb.	....	1.27	6,795
Gas	368,900 cu.ft. (corrected to 0 Deg. C. and 760 mm.)	....	0.887 (air as standard)	

TABLE III—GENERAL ANALYSIS OF MATERIALS UNDER CONSIDERATION

Mexican Gas Oil

Bé. gr.	26.2 deg.	Sp.gr.	0.8973
Fired	1:45 p.m. over 2:05 p.m.	Time to distill	2 hr. 55 min.
Initial b.p.	363 End point (90 per cent) 710 deg. F.	Range	347 deg. F.
		Color before	Black
Charge	800 cc.	Color after	Yellow
Flash	210 deg. Cleveland	Universal Saybolt Viscosity 100 deg. F.	50 sec.
Fire	240 deg. open cup		

Condenser. Running Water to Dry.

Per Cent Over	Temp., Deg. F.	Bé.Gr. (In Deg.)	Remarks
10	479	38.0	1.5 per cent at 410 deg. F
20	513	34.1	0.35 per cent water
30	542	31.2	0.4 per cent loss
40	571	29.1	....
50	591	27.4	Sulphur, 3.11 per cent
60	620	26.2	....
70	658	24.7	....
80	686	23.7	....
90	710	24.1	....
98	690	19.4	....

Pressure Distillate From Mexican Gas Oil

Bé.gr.	44.8 deg.	Time to distill	3 hr. 4 min.
Fired	1:58 p.m. over 2 a.m.	Range	338 deg.
Initial b.p.	88 End point 426	Color before	Yellow
Charge	1,000 cc.		

Condenser 57 Deg.

Per Cent Over	Temp., Deg. F.	Bé.Gr. (In Deg.)	Sp.Gr.	Remarks
2½	122	87.7	0.643	Off color at 158 deg.
5	134	84.4	0.653	....
7½	158	80.2	0.666	410 Deg. F. cut
10	188	72.9	0.690	52.5 per cent 54.2 gasoline
12½	216	66.9	0.711	46.1 per cent 31.8 gas oil
15	233	62.0	0.729	1.4 per cent loss
17½	256	58.9	0.741	Initial b.p., 126 End point, 422 deg.
20	263	56.7	0.750	424 cut
22½	282	54.7	0.758	57.8 per cent 58.1 gasoline
25	296	52.5	0.767	40.8 per cent 31.3 gas oil
27½	310	50.6	0.775	1.4 per cent loss
30	323	49.0	0.782	Initial b. p., 120 deg. F.
32½	334	47.4	0.789	End point, 437 deg.
35	348	46.1	0.795	....
37½	354	45.4	0.798	....
40	367	44.1	0.804	....
42½	375	42.4	0.812	....
45	386	41.6	0.816	....
47½	395	40.5	0.821	....
50	400	39.9	0.824	....
52.5	410	38.9	0.829	....
55	418	38.3	0.832	....
57.5	425	37.5	0.836	
57.8	426	....	.....	....

Cracked Residuum From Mexican Gas Oil

Bé. gr.	17.4	Cold test	—45 deg. F.
Fired	2:06 p.m. over 2:11 p.m.	Time to distill	24 min.
Initial b.p.	382 deg. End point, 775 deg.	Range	—43 deg. F.
		Color before	Black
Charge	100 cc.	Color after	Brown
Flash	190 deg.	Universal Saybolt viscosity 100 deg. F.	66 sec.
Fire	270 deg.		

Per Cent Over	Temp., Deg. F.	Remarks
5	487	0.5 per cent at 410 deg.
10	510	....
15	524	5.3 per cent coke
20	545	....
25	557	0.2 per cent loss
30	569	....
35	580	Conradson carbon
40	595	Residue 4.1 per cent
45	605	....
50	620	....
55	638	....
60	655	....
65	680	....
70	695	....
75	720	....
80	741	....
85	760	....
94.5	775	....

Gas Analysis of Uncondensible Gas

	Per Cent
Carbon dioxide + hydrogen sulphide	7.8
Unsaturated hydrocarbons	8.0
Oxygen	0.1
Carbon monoxide	0.3
Hydrogen	2.3
Saturated hydrocarbons (by difference)	81.5
Specific gravity (air = 1)	0.887

Coke

	Per Cent
Soluble in carbon bisulphide	27.4
Ash	0.93

TABLE V—PERCENTAGE DISTRIBUTION OF SULPHUR IN THE PRIMARY PRODUCTS ON A BASIS OF TOTAL SULPHUR PRESENT

	Sodium Peroxide Bomb Method		Oxygen Bomb Calorimeter Method	
	Wt. in Lb.	Per Cent	Wt. in Lb.	Per Cent
Total weight of sulphur in products	18,862	100	17,586	100
Coke	370	1.96	355	2.01
Residuum	12,168	64.51	10,917	62.08
Pressure distillate	4,055	21.49	4,055	23.05
Gas	2,269	12.02	2,269	12.90
Total	.....	99.98	.....	100.04

TABLE IV—DISTRIBUTION OF SULPHUR ON THE BASIS OF PERCENTAGE IN THE PRIMARY PRODUCTS

	Nitric Acid Oxidation Method		Sodium Peroxide Bomb Method		Oxygen Bomb Calorimeter Method		
	Per Cent of Sulphur by Wt.	Total Wt. of Sulphur in Lb.	Per Cent of Sulphur by Wt.	Total Wt. of Sulphur in Lb.	Per Cent of Sulphur by Wt.	Total Wt. of Sulphur in Lb.	Wt. of Total In Lb.
Raw oil	2.19	13,517	3.11	19,196	2.90	17,899	617,225
(Lamp method of analysis in all oils)							
Pressure distillate	1.40	4,055	1.40	4,055	1.40	4,055	289,609
Residuum	2.95	8,387	4.28	12,168	3.84	10,917	284,299
Coke	4.48	304	5.45	370	5.22	355	6,795
Gas (cadmium chloride absorption analysis)	8.5	2,269	8.5	2,269	8.5	2,269	26,420
Total weight of sulphur in primary products	....	15,035	....	18,862	....	17,586	....
Difference in per cent of sulphur in raw oil and in primary products	....	+10.9	....	—1.6	....	—1.7	....

hydrogen sulphide in the gas. The change of volume is also noted. In actual practice two Wetzel bulbs in series were used as absorption vessels in order to insure complete absorption. The volume of hydrogen sulphide in the gas as calculated from the determination by this method is 6.8 per cent, which checks very closely the above approximated amount. Under the circumstances it seems that very little if any absorption of the carbon dioxide takes place.

It is to be noted here that for very small amounts of hydrogen sulphide in gases the method making use of absorption in a solution of iodine and back titration with sodium thiosulphate is in all probability the most accurate.

Discussion of Methods

There is no doubt that the results as obtained by the oxygen bomb and the sodium peroxide bomb method give consistent results, as well as results which are of the same order of magnitude. The oxygen bomb method is preferable from the viewpoint of accuracy, since a cleaner precipitate is obtained.

The results obtained by oxidation with nitric acid are not favorable to the use of that method. Comparison of the sum total of sulphur in the primary products with that of the raw oil would seem to indicate losses in the latter, probably by volatilization during digestion of the oil with the acid.

In a critical examination of the data it must be recalled that the operations of measuring large quantities of liquids, gases and solids by meter, gage or scales are a function of the final comparisons as well as the analytical methods. There is also to be considered the possibility of some sulphur reacting with the metal parts of the system.

Conclusions

From the results set forth in Tables IV and V it should be pointed out that on a basis of the actual percentages of sulphur in the primary products of cracking hydrocarbon oils, the content of sulphur increases with the density of the liquid and solid products, but is higher in the gas than in any of the products. This is very closely analogous to the distribution of nitrogen in the destructive distillation of oil shale.

On a percentage basis with regard to the total amount of sulphur present the analogy does not hold for the coke, owing principally to the relatively low percentage of this product, although there is an increase in the percentage of sulphur with increasing density for the liquid and gaseous products when calculated on this basis.

Increase in Output of Aluminum for 1922

The value of the new aluminum produced in the United States during 1922 is reported as $13,622,000, an increase of about 25 per cent over the value in 1921. During the first half of the year domestic aluminum was quoted at 20 cents a pound for 99 per cent grade. In August the price rose slightly and on the passage of the tariff act rose to 23 cents a pound, where it remained during the rest of the year.

Exports of aluminum from the United States during 1922 included 1,538,079 lb. of ingot and scrap aluminum and alloys containing aluminum, 2,808,946 lb. of plates, sheets, bars, strips and rods and 4,548,939 lb. of manufactured articles, which represents a very large increase over the amount exported during the previous year. Imports, on the other hand, also increased to 31,482,983 lb. during the early part of 1922, as compared to 26,177,852 lb. for the corresponding period in 1921. This includes aluminum in crude form, scrap and alloys of any kind in which aluminum is the material of chief value.

Electrically Sintered Magnesite

Electrically sintered magnesite, a material having the highest melting point of any commercial refractory, is now being produced in quantity by the Carborundum Co. It is made from carefully selected California magnesite and is thoroughly fused in an electric furnace. It contains about 95 per cent MgO and less than 1 per cent of iron oxide and has a melting point of about 2,600 deg. C.

The material is especially resistant at high temperatures to iron or iron oxide. This makes it most valuable for lining metallurgical furnaces, either in the form of bricks or in granular form, tamped in. A further unusual feature of electrically sintered magnesite is that it does not contract when subjected to conditions encountered in industrial installations.

Some Notes on Quicksilver

The production of quicksilver in the United States in 1922, from the reports of the United States Geological Survey, amounted to 6,497 flasks of 75 lb. net, as compared with 6,339 flasks in 1921, which was the smallest annual output in 72 years of recorded production of domestic quicksilver. Of the total amount produced in 1922, California produced 3,494 flasks, Texas 2,725 and Nevada and Oregon 278. The average price of quicksilver in 1922 per flask of 75 lb. is reported as $58.95 in New York and $57.78 in San Francisco. However, the tariff act of 1922 placed a duty on imported quicksilver of 25 cents a pound, equivalent to $18.75 a flask. At the end of the year, the directors of the great Almaden mine in Spain reduced the price at the mine to about $45 per flask. No important additions to the known resources of domestic quicksilver were made during 1922, but the effect of the new import duty will probably result in a moderate increase in production for 1923.

Silicate of Soda In the Ceramic Industries*

Its Properties Depend Upon Ratio of Na_2O to SiO_2 —What Grades Are Most Suitable for Various Purposes

BY JAMES G. VAIL
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CONSIDERATION of silicate of soda in the ceramic industries or, for that matter, in any industry must be predicated on an understanding of what is meant by the term silicate of soda. In a commercial sense silicate of soda is not more definite a term than clay. Its connotation is generic rather than specific. Attention must be called to this fact, because in spite of a voluminous literature there are still many technical men who think of a definite sodium silicate when they see the sirupy liquid of commerce.

Sodium metasilicate has been studied by several workers, notably Erdenbrecher, who has prepared three crystalline hydrates of Na_2SiO_3 with four, six and nine molecules of water, respectively. These may all be prepared at ordinary atmospheric temperatures. They all melt in their water of crystallization to liquids of low viscosity relative to the commercial preparations on the American market.

The ratio of Na_2O to SiO_2 is the usual index of the type of a commercial silicate solution. As the percentage and molecular ratios are so nearly alike, custom has chosen the more convenient percentage ratio. This may vary between the 1:1 of the metasilicate up to 1:4 or even higher. The properties of the products at the two ends of the scale are very different, and any intermediate composition can be produced in general without sharp breaks in the curves which represent the changing characteristics. Although it is likely that a compound of the ratio 1:2 does exist, its presence in the familiar solutions of this composition has not been completely proved. It is important then when you hear or read about silicate of soda to think, Which silicate of soda?

USE IN MENDING SAGGERS

Perhaps the use of silicate of soda for mending saggers is more widely applicable in the ceramic industries than any other. Where the break is a simple one, the process of repair is so simple as to be a marked economy. For this purpose a silicate which dries in the air to form a firm joint and retains its bonding quality as the temperature rises should be selected. All air-dried silicate solutions, even when they develop a bond strength above 1,000 lb. per sq.in., are hydrous. They can be completely dehydrated only at kiln temperature. During the removal of the last few per cent of water the bond strength of most silicate solutions is much reduced. At temperatures near 2,000 deg. F. sintering begins and the silicate again is sticky and has holding power. The ratio which we have found most suitable for this sort of work is about $Na_2O:SiO_2$ :: 1:2.4. If a grade containing more silica is used, its strength will decline earlier with advancing temperature. If a more alkaline type be selected, the cement will have a lower melting point and will set too slowly at atmospheric temperature. Silicate of soda should be mixed with a refractory clay to make the sagger mending cement. A mixture of calcined and raw clays is best, though not essential. A wide variety of clays can be used. The silicate of ratio 1:2.4 is usually sold as a solution of about 47 per cent solids testing 52 deg. Bé. About two parts by weight of this and one part of powdered clay should be used. A little water may be added to permit mixing the cement to a smooth, thick, creamy consistency. It is best to paint both broken surfaces of the sagger with the cement, taking care to apply enough to prevent a premature set due to absorption of water from the wet cement by the porous body of the sagger. This would occur only when the cement is spread very thin. Enough should be used to allow the cement to remain sticky for 5 minutes if exposed to the air. The broken parts should be pressed together so that a little is squeezed out and allowed to stand undisturbed over night. A joint formed in this way is usually stronger than the body of the sagger.

Cements made with clay and silicate of soda are also useful in making gas-tight brickwork in kilns, boiler furnaces, coke ovens and the like.

DEFLOCCULATING CLAY SUSPENSIONS

The influence of electrolytes on the suspension of clay in water as applied to refining and casting has received a great deal of attention and is the subject of a fairly voluminous literature. Beginning with a discussion of Acheson's paper on Egyptianized clay before this society in 1904, when W. D. Gates called attention to a similar effect of silicate of soda on clay, members of the American Ceramic Society have made numerous contributions to our knowledge. Bleininger and Schurecht should be especially mentioned in this connection. It is worthy of note that much that has been written is either not clear or entirely silent as to the kind of silicate employed. All solutions of silicate of soda will indeed assist in the suspension of clays and up to an optimum concentration make the separation of other minerals easier. In each case amounts beyond the optimum concentration produce a lesser effect or cause the flocculation of the suspended clay.

The work of Schurecht has shown that the effect of silicate is not merely the effect of a given amount of sodium oxide which may be added in any convenient form. A unit of Na_2O as sodium silicate has a larger effect in reducing the viscosity of a clay slip than the same amount of Na_2O added either as hydroxide or carbonate. The silica must enter into the reaction, and it appears that a study of the various types of silicate with different ratios of $Na_2O:SiO_2$ would be a valuable contribution to our knowledge of the art. The hydrogen-ion concentration is certainly an important factor in the effect of electrolytes on clay suspensions; the different types of silicate provide a convenient means for securing the concentration suited to the manipulation of each particular clay and the buffer effect of the silica should make it more easy to control the characteristics of the slip or the suspension in the refining process.

EFFECT ON DENSITY SHRINKAGE

The varieties of silicate of soda should also be studied with reference to their effect on the density shrinkage and strength of the ware. If one form of sodium silicate added to a clay in amounts of less than 2 per cent based on a 40 per cent solution can cause differences of more than 100 per cent in the dry strength or the

*Presented before the Terra Cotta Division, American Ceramic Society, at the Pittsburgh meeting, Feb. 12-16, 1923.

fired strength of clays, it is a matter of concern to know whether the form arbitrarily chosen for the study was in fact the most suitable. We have abundant evidence that the various forms do not behave alike.

Bonding Abrasive Wheels

One of the oldest uses of silicate of soda is to form a bond for abrasive materials in the manufacture of grinding wheels and abrasive stones. The process is widely used and has numerous advantages, important among which is the possibility of forming a wheel on one day and putting it into service the next. The silicate bond easily produces masses having a tensile strength of 2,000 lb. per sq.in. and the loss in process is very small. The silicate ordinarily employed for wheel manufacture has a ratio of 1:2 and is concentrated to a very sticky solution containing about 54 per cent solids. This solution is mixed with approximately an equal weight of a finely pulverized mineral such as clay or silica. The chemical characteristics of this powder can be varied considerably and good results secured, but its fineness and the thoroughness with which it is mixed with the silicate solution and the abrasive grains are important. The tamping of the mixture into molds calls for experience and skill to produce a uniform body. The wheels are first air dried at temperatures below the boiling point of water for a length of time dependent on the size of the wheel and then baked at about 450 deg. F. for several hours. The chemistry underlying this process is not fully understood, although a large amount of practical experience has developed a technique which gives good results. It is not, for instance, known that there is any reaction between the mineral filler and the silicate solution, and yet wheels are made sufficiently resistant to water to be run wet.

The water resistance of some mixtures is, however, improved by the addition to the inert mineral of small quantities of oxides capable of reacting with the silicate at the temperatures used in the process. One of these is zinc oxide. Fundamental research on the reactions of the silicate abrasive wheel process is needed to understand what has been empirically found to be good practice and to point the way to improvements. We already know that a silicate of very different character from those used for adhesive purposes is required.

Whether it be the making of silicate cements for mending saggers and setting brick with gas-tight joints, or the regulation of the flowing and suspension characteristics of mixtures of clay and water with small additions of silicate solutions, or the manufacture of quick process silicate abrasive wheels, the fact is worth remembering that the various forms of silicate have different properties. The grade best suited for one process may be quite unfit for another and many a process can be perfected by choosing a silicate solution adapted to the peculiarities of the clay with which it comes in contact and the conditions of its use.

Increase in Automobile Production

The Department of Commerce in Washington reports that automobile production increased in January and was the highest on record with the exception of last June. The output of passenger cars increased from 223,706 cars in January to 254,415 in February. Truck production amounted to 21,354 cars in February, as against 19,376 cars in January. Reports came from approximately 90 passenger car and 80 truck manufacturers.

Increasing Profits Without Increasing Sales

Dr. E. B. Lathrop has made a very good point in an article under the above title which appeared recently in the Philadelphia Chamber of Commerce *News Bulletin*. He points out first that the normal reaction of the executive is to urge an increase in sales in order to increase profits. On the other hand, in industries where the market saturation point is nearly reached or in which production will vary considerably from year to year due to an uncertain demand, it is much easier to save on the cost of purchases and better technical control. Suppose, for example, a firm makes $1,000 saving per month by better buying and better technical work, and suppose too that the firm is making a 10 per cent net sales profit. This monthly saving of $1,000 would be equivalent to a total yearly increase in sales of $120,000. Viewed from this standpoint, what might be termed "intensive cultivation" is very highly profitable.

Importance of Technical Purchasing of Raw Material

Take, for example, the purchasing of a common raw material such as ordinary salt. If we study different industries in which this material is used, the importance of technical purchasing can at once be made evident. For example, sodium chloride is used in ice cream manufacture. It is well known that different grades of salt give different results in the speed of making the ice melt. This of course is due to the calcium and magnesium chloride impurities in the salt, and yet the ice cream manufacturers have taken no advantage of this very common observation. They have not attempted to balance the relative corrosion which their salt may give against the more rapid freezing which is obtained.

In producing soap, salt is used to separate boiled soap from the excess of free alkali. The sodium soaps are all soluble, but calcium, magnesium and barium soaps are insoluble and have no value as cleansing agents. Obviously, then, the impurities in common salt will become invidious impurities in the soap itself.

Purchasing Department Should Wage an Aggressive War With Technical Implements

Again, in the manufacture of hydrochloric acid, which is prepared from common salt with either sulphuric acid or niter cake, the sodium sulphate thus manufactured is used in glass and paper making. Naturally the impurities which appear in the salt will become impurities in the salt cake. Examples in which the impurities in the raw material vitally affect the subsequent technology could be multiplied almost indefinitely. Here is a problem in which technical knowledge can play as important a rôle as it does in technical selling. The sales engineer has come to stay. His function in industry and his utility have been demonstrated. How about the purchase engineer? Is it not just as logical to make use of technical knowledge in purchasing as it is in sales? Instead of waging what might be termed a defensive war, why should the purchasing department not wage an aggressive war, using the modern implements of technical knowledge to carry it out? The purchase engineer and the sales engineer go hand in hand. They are twin positions, and in fact in many companies the same department, and the same engineers would adequately fill both functions. A least here is room for constructive thought and constructive action.

Heat Salvage in Small Furnaces

Thirty Per Cent Fuel Saved on Even a Small Tool-Room Furnace by a Simple Recuperator—Heat-Resisting Pipe Offers Ideal Medium With Which to Build Heat Interchanger

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INCREASING interest in fuel conservation in recent years, coupled with the higher cost of fuel for industrial operation, has forced the recognition that waste heat, heretofore not considered an item of value, can be utilized, and by simple methods made to do useful work, even on small heating furnaces. In units of larger size, the value of waste heat has long been known and reclaimed to a considerable degree in blast, open-hearth, large billet heating and reverberatory furnaces, glass tanks, pot furnaces and others.

Reclamation of waste heat in these larger units was due not to a desire to save fuel, but to the necessity for increasing the flame temperature. High furnace temperatures for heating operations where the metal or compound must be raised to 2,700 deg. F. or more is accomplished by adding, to the fuel itself, appreciable quantities of sensible heat in the air required for combustion. Thus, Pittsburgh natural gas, containing 1,130 B.t.u., has a maximum flame temperature, when burned in the correct amount of cold air, of approximately 3,560 deg. F. At this temperature all the heat liberated during combustion is carried away by the products of combustion. If the air is preheated by any method to, say, 1,200 deg. F., that air will bring in 250 B.t.u. of sensible heat, which, if added to the original value of the gas, will give a total calorific value of the mixture of 1,130 + 250, or 1,380 B.t.u. per cu.ft.

This gas, with a calorific value of 1,380 B.t.u. per cu.ft., will have a theoretical flame temperature of approximately 4,280 deg. F. The increase comes entirely from the preheated air, and naturally, with higher flame temperature, a heating operation will be carried out

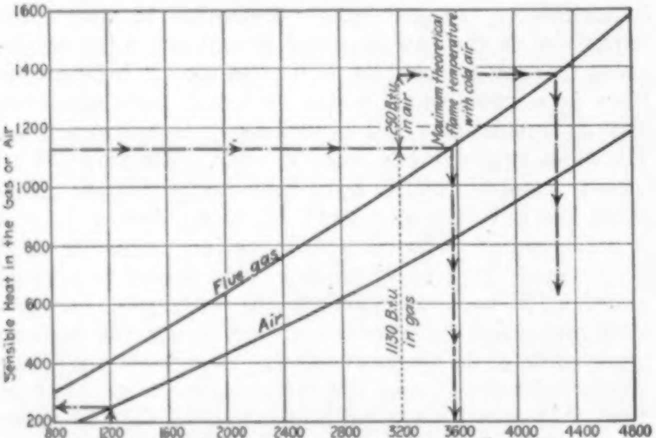


FIG. 1—SENSIBLE HEAT IN AIR AND FLUE GAS
Assumptions: Pittsburgh natural gas burned in theoretical amount of air.

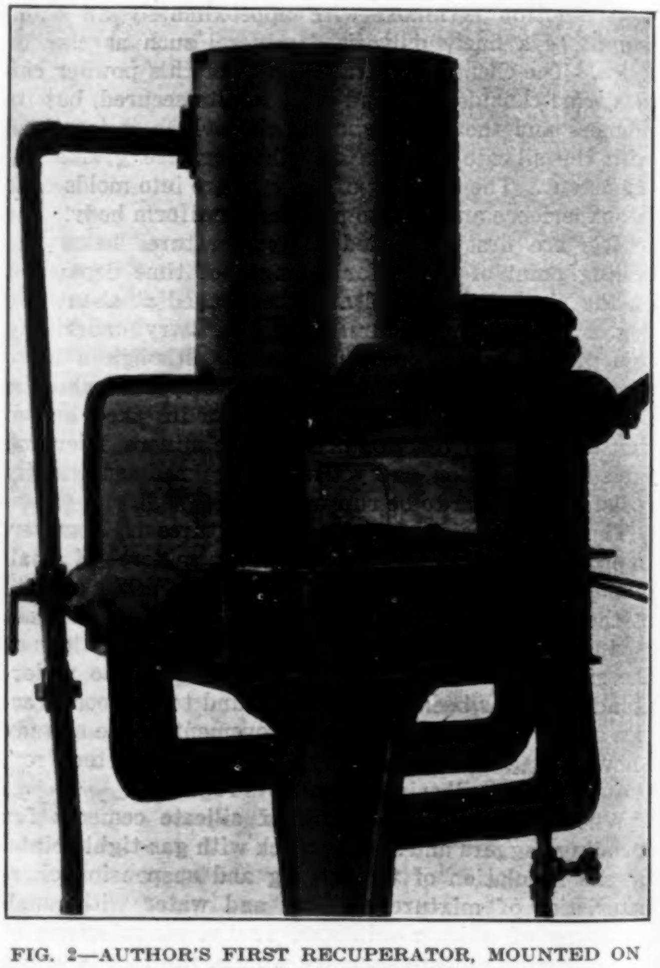


FIG. 2—AUTHOR'S FIRST RECUPERATOR, MOUNTED ON TOOL-ROOM FURNACE

with considerably greater rapidity than with lower flame temperature. Other similar problems in maximum flame temperatures on Pittsburgh natural gas may be solved graphically as shown in Fig. 1.

Waste heat may be salvaged in three general ways:

1. By placing a steam boiler in the waste gas flue between furnace and stack to generate steam.

2. By use of the regenerative furnace. This has two sets of reversing chambers in the waste gas flue between furnace and stack. The flue gas passing out gives up its heat to the brick checkerwork of one chamber and on reversing incoming air picks up this heat.

3. By recuperators. These are tubes placed in the waste flue, between furnaces and stacks, and through

which air for combustion is passed, thereby absorbing heat.

For obvious reasons heat-salvaging apparatus of the first classification is out of the question for small furnaces.

Regenerators of the second classification are relatively great in first cost, upkeep and labor cost, and require careful operation to accomplish good results.

Recuperators appear to offer the best solution of waste heat recovery in smaller furnaces. Once installed, they require no operating attention and if properly designed, upkeep cost is a relatively small item. Within certain limits, recuperative elements may be of tile or metal and inclosed in brick-lined containers. Tile recuperators are subject to the very severe criticism that, being of firebrick mixture, they resist the flow or transfer of heat to a very much greater degree than does silicon carbide or metallic elements. Accordingly, to secure an equivalent heat transfer from hot flue gas to colder air, it is necessary that the transfer area of tile recuperators vary directly as its thermal conductivity. To obtain equivalent results, then, the specified transfer area of tile recuperators must be at least five times as great as with silicon carbide elements; and from five to twenty-five times as great as when metallic elements are used as the medium of transfer. In addition to the foregoing basic objection to the use of tile recuperator elements, tile is fragile and hard to lay up with joints that remain tight enough to prevent escape of air into the flue gas compartments.

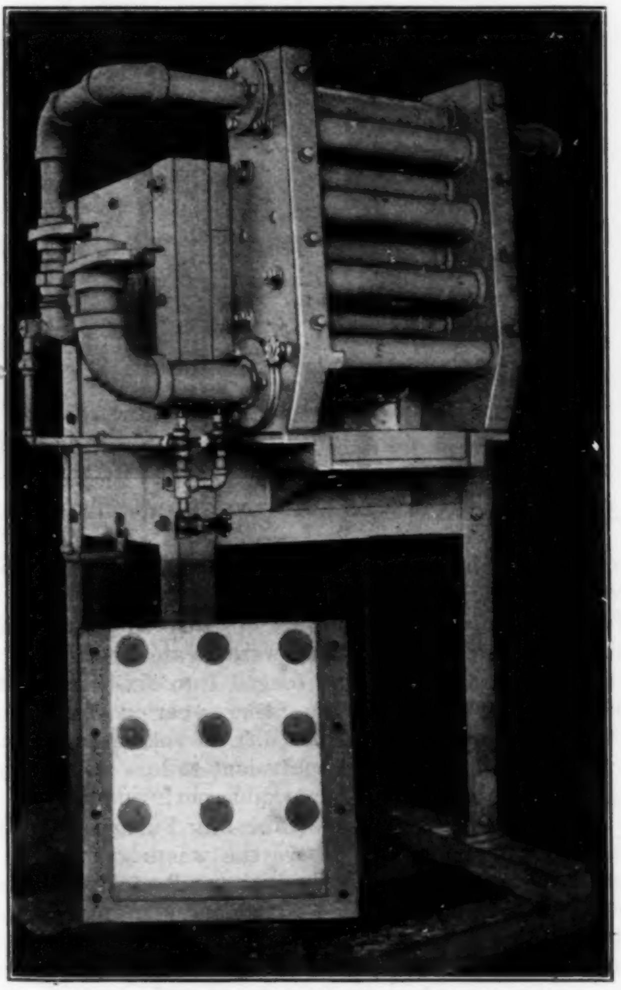


FIG. 3—W. S. ROCKWELL CO.'S "ECONOMIZER FORGE" (FRONT REMOVED)

FIG. 4—EXPERIMENTAL RECUPERATOR ON FORGE FURNACE

As the scope of this article includes relatively small furnaces, metallic recuperators only are considered, for in such practice, limitations of the tile recuperator prevent its successful use. Tile recuperators have a fairly well defined field of application in larger furnaces.

While silicon carbide is a much better medium for recuperator elements than fireclay tile, on account of its greater conductivity, it is open to the objections of high first cost, fragile nature and the same difficulty of making tight joints. With their high thermal conduction and relatively low cost, metallic elements without doubt are the best elements to use in recuperators. But if satisfactory results are to be secured, a thorough understanding must be had of their properties, reaction under the working heats, and a knowledge of the engineering principles of recuperator design.

A consideration of the metals available for recuperators of this kind may be interesting. Certain of the nickel-chromium alloys on account of their high melting points and resistance to gases under high temperatures would make ideal recuperator elements. The high first cost of these alloys and difficulty of securing sound castings with thin walls are severe drawbacks to their general use, but even so, these alloys are the only metals available which will stand temperatures of the metal walls reaching 2,000 deg. F. or more.

Cast iron has long been used in heat exchangers—recall the original blast-furnace stoves made with cast-iron pipe elements. Cast iron was fairly satisfactory for that service as long as the temperatures encountered were relatively low. Cast iron is reasonably satisfactory for recuperator elements where the final temperature of the air does not exceed a few hundred degrees,

but it has the disadvantages of requiring a heavy wall section and relatively great weight.

It is desirable to bring air and flue gas into as close and continuous contact as possible throughout the entire length of the heat exchanger. Based on present experience, it appears that relatively small pipes, say 4 or 6 in. diameter, manifolded so as to secure proper area, offer the best available conduit. In the writer's practice, it is customary to force air to be heated through cylindrical containers which are surrounded by the hot flue gas. The air passes counter-current to the gas, both going at relatively high velocity. For low-temperature work (where the flue temperatures do not exceed 1,000 deg. F. and final temperature of the air 300 or 400 deg. F.) wrought-iron pipe gives excellent results. But when the flue gases are from 1,000 to 2,200 deg. F. and final air temperatures 300 to 1,200 deg. F., untreated wrought-iron or steel pipe does not last long.

TABLE I—HEAT BALANCE
Figured in B.t.u. per hour

	Non-Recuperative	Recuperative
Total in fuel	119,645	82,350
Returned in preheated air	0	8,668
Total to furnace	119,645	91,018
Radiation loss:		
Combustion chamber	25,331	30,911
Heating chamber	36,542	23,028
To recuperator	0	37,079
Vent loss	57,772	0
Total	119,645	91,018
To recuperator		37,079
Returned to heated air		8,668
Radiation loss in recuperator		15,208
Final vent loss		13,202
Total		37,079
Fuel saving		31.3%

If steel pipe is impregnated with aluminum (Calorized after the method of the Calorizing Co. of Pittsburgh), pipe recuperator elements will give an economical performance in waste heat recovery within the temperature limits just mentioned. The life of calorized pipe is from five to ten or more times the life of untreated pipe. The cost of the special treatment is quite low. A calorized pipe has the added advantage of maintaining the same high rate of thermal conductivity at all times, for it does not scale.

The design of thermal recuperators should not be attempted by those not thoroughly versed in the art, for many factors must be co-ordinated to produce economical results; otherwise an installation that is neither economical nor satisfactory will result.

A considerable number of furnaces employing the recuperative principle of salvaging waste heat by use of metallic recuperators are in general use. The writer believes that he developed in 1913 and arranged to have placed on the market one of the first commercial recuperators for small furnaces. This consisted merely of mounting on top of a small tool room furnace a brick-lined chamber containing a coil through which the air was forced (Fig. 2). That the use of even this small device was worth while is indicated from the heat balance (Table I) of one furnace operating without a recuperator and one furnace with recuperator, both furnaces being of exactly the same size and operated under identical temperatures in the heating chamber (2,450 deg. F.).

It is interesting to note that less than 10 per cent of the total B.t.u. required in an average hour was represented in the heat returned in the air. The recuperator effected a total saving of 31 per cent; less than 10 per cent was represented in actual heat returned, while over 20 per cent was had through increased flame temperature, less weight of furnace gases and other contingent economies that generally enhance the value of recuperative devices.

The idea exemplified by Fig. 2 may be applied, of course, in many ways. Fig. 3 shows an especially neat and compact recuperator built alongside a small forge furnace (designed by the W. S. Rockwell Co.). It has the front removed in order to show the calorized preheater pipes.

Beginning early in 1915, and extending over a period of more than 2 years, in collaboration with John W. Griswold, the writer made a series of tests on recuperative forge furnaces. The first experimental furnace, as constructed in the laboratory of Tate-Jones & Co., Inc., is shown in Fig. 4. This recuperator was designed along the lines of a Junker calorimeter: Flue gases were drawn through the recuperator by an exhauster mounted above, while air for combustion was forced through by a positive pressure blower (not shown in the figure). Much trouble was at first encountered with the heat exchanger elements. While only about 30 in. in diameter with 45 in. effective height, they had an interior transfer surface of over 100 sq.ft. and at times reduced the gases of combustion from 2,000 to 400 deg. F., and raised air temperatures from atmospheric to 1,700 deg. F.

The results secured were so very favorable that a

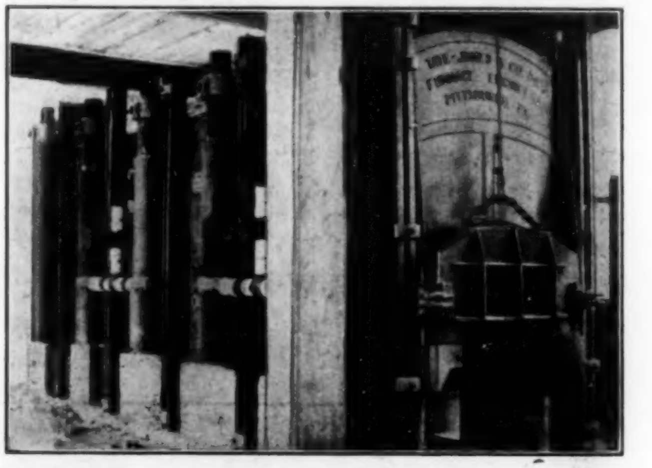


FIG. 5—CAR TYPE FURNACE WITH SIX RECUPERATORS

second experimental furnace and recuperator was built for drop forge work in a large manufacturing plant at Toledo, Ohio. In this furnace forty to fifty steel bars 3 in. diameter, 40 in. long were heated per hour to about 2,000 deg. F. to be forged into six-throw automobile crank shafts. In one 24-hour period of ordinary shop operation it used 3,300 cu.ft. of coke-oven gas per ton of forgings. This is equivalent to less than 15 gal. fuel oil per ton—a very remarkable performance.

Fig. 5 shows a Car Type Annealing Furnace utilizing the same principle, but where the waste gas flues are brought outward into individual small stacks, instead of following the usual practice of passing upward through the furnace walls. Surrounding each of these stacks is a metal jacket through which air for combustion is forced and part of the heat of the waste gas is thus transferred to the air and reclaimed.

Recuperative forging furnaces of large size have been designed, patented and constructed by the Heppenstall Forge & Knife Co., one of that company's installations being shown in schematic outline in Fig. 6. Recuperators in this furnace are calorized U tubes, suspended in a chamber beyond the heating furnace proper, and into which the waste gases are directed. Air is forced through these tubes, where it is heated and thereupon

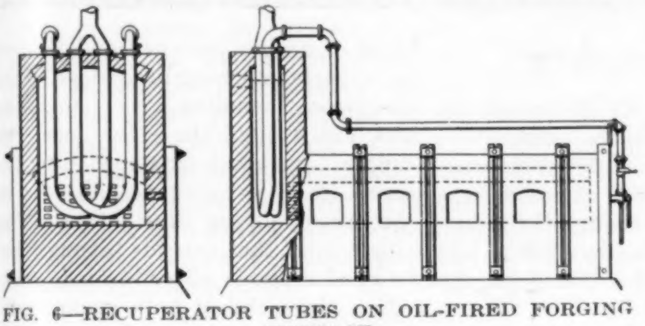


FIG. 6—RECUPERATOR TUBES ON OIL-FIRED FORGING FURNACE

led to the oil burners at the front end. Remarkable operating economies are shown by this installation. Temperatures from the recuperative effect are relatively low (600 to 700 deg. F.) and only about one-half of the total air required for combustion is preheated.

Interesting experiments are now being conducted on calorized pipe blast-furnace stove elements, with a view toward determining to what extent calorized air pipes can replace the regenerative brick chambers. Complete data on these experiments are not now available for publication, but extremely satisfactory results are shown from the preliminary figures. A consideration of blast-furnace stoves is beyond the scope of this article; but it is mentioned to show that the subject is of sufficient interest to cover all phases of industry wherever the use of heat is of importance.

Economies From Recuperation

Naturally the question will be asked, "How much can we save by the use of recuperative devices?"

There are at least twenty variable factors which will have a bearing on the ultimate over-all saving. Saving will be less where the existing non-recuperative furnace practice is very good. Poor or indifferent furnace practice is vastly improved by the use of recuperation; when provision is made for the installation of recuperative elements and the furnace placed in the hands of competent engineers, they will frequently so change the existing design of the furnace itself as to produce a still greater economy.

It is possible to design the recuperator to salvage almost any amount of waste heat that may be arbitrarily named. The higher the temperature of the waste furnace gases the greater the percentage that can be economically recovered. In forging practice it is economical to premise a design on a 50 per cent recuperative efficiency; for low-temperature heat-treating practice in small furnaces it is seldom economical to carry recuperation beyond a maximum of 30 or 40 per cent. On the other hand, recuperators operating on relatively low recuperator efficiencies will be found to produce material over-all savings. A chart is shown in Fig. 7 giving: (*a*) the fuel saving possible with waste gases at any temperature, (*b*) combustion conditions within the ordinary range of furnace practice, and (*c*) the saving with recuperators of varying effectiveness. This chart shows, for example, that gases which leave a furnace at 1,400 deg. F. and have entrained 10 per cent excess air carry out a total heat equal to that produced by 38 per cent of the fuel fired. If a recuperative device having a 40 per cent thermal efficiency is connected to the furnace, then over 15 per cent of the total heat fired will be returned to the furnace as sensible heat in the air for combustion.

The theoretical fuel saving itself is of considerable interest, but in every case the actual saving will be found much greater than the theoretical; for, as explained before, the addition of sensible heat to the fuel gives the equivalent result of increasing the calorific value of the fuel and thus increasing flame temperature. How this works out in theory and practice may be seen by re-examination of the chart Fig. 1, which shows the heat in the products of burning 1 cu.ft. of Pittsburgh natural gas, containing 1,130 B.t.u. per cu.ft. If we read down from this curve on the vertical ordinate, we shall find the theoretical flame temperature a trifle less than 3,600 deg. F. If the air is preheated by recuperation to 1,200 deg. F., that air will contain 250 B.t.u., which, added to the 1,130 originally in the gas, will give a total calorific value of the fuel of 1,380 B.t.u. Reading through as before, Pittsburgh natural gas with 1,380 B.t.u. will have a theoretical flame temperature of 4,280 deg. F. Thus, by increasing the calorific power of the fuel 18 per cent, we increase flame temperature over 20 per cent.

It seems wise to point out the advisability of entrusting the design of recuperative devices only to competent engineers. The mass of variables affecting actual results can be only roughly evaluated from such data as are at present available. This points to the likelihood of obtaining only mediocre results by those who do not have available the necessary experimental data as yet unpublished.

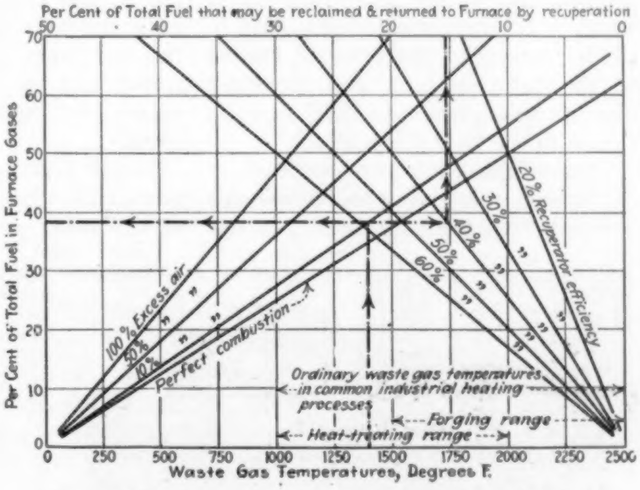


FIG. 7—FUEL LOSSES AND POSSIBLE SAVINGS

Although this article presents data which cannot be classified as conclusive, yet they are sufficiently indicative to call attention to the possible savings of our natural resources. Fuel savings and other economies are now possible by making comparatively inexpensive alterations in furnace installations. The era we are now facing promises to be one of the most severely competitive that manufacturers have as yet experienced. Many plants operating on narrow margins should find such basic savings of vital significance.

Machinery and Appliances for Production and Control

Equipment News

From Maker and User

Materials and Accessories for Chemical Industries

Automatic Furnace and Quencher

The W. S. Rockwell Co., of New York, manufacturer of industrial furnaces, has had on the market for some time an automatic rotary heating furnace and an automatic rotary quenching tank. It has recently effected a combination of these two units so that they may be operated as one; and heating and quenching can be carried on as a continuous, automatic unit process. The accompanying photograph shows the set-up of the combined units.

The operation of these units separately is well known to those interested. When operated together the procedure is as follows: After the material has been slowly brought up to temperature and discharged from the furnace, it slides into the submerged end of the quenching tank, where it is automatically picked up in small batches by the internal thread of the rotating tank and conveyed through the quenching fluid as it is raised to the final discharge.

This combination provides, then, a continuous unit giving individual and uniform treatment in both heating and quenching. By its use, as against that of the elements separately, chances for trouble with the product are largely eliminated. A real advantage is also gained through the reduction of labor required to operate and the elimination of dependence on the human element.

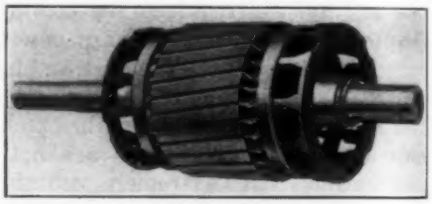
AUTOMATIC ROTARY FURNACE AND QUENCHING TANK

Heavy Duty Motor

Of recent years there have been few innovations of great novelty in the field of electrical motors, which adds particular interest to the new line of heavy duty, polyphase squirrel-cage motors recently placed on the market by the Louis Allis Co., of Milwaukee, Wis.

In the usual design of this type of motor, the rotor winding is formed with the bars individually joined to the end rings. This makes a multiplicity of joints and is a source of delays for repair when loose bars occur.

In the L-A Type H. D. motor, the new Allis type, the entire winding of the rotor consists of an integral sheet of copper, punched and formed by a special mechanical process. This one-piece winding is machine wrapped around the rotor core, the copper bars being expanded into the core slots by swaging, as indicated in the accompanying illustration. The single joint that extends through the two end rings is silver welded, after which the metal at both connections is processed by means of a contracting operation that rehardens the copper at the point where the heat, applied during the welding, softened it. This treatment results in a lapped,



ROTOR FOR ALLIS SQUIRREL-CAGE MOTOR

silver-welded joint of maximum strength. The rotor winding, except for the joint in the two end rings, is electrically and mechanically as substantial and indestructible as a piece of pure copper pipe.

On account of being fabricated of comparatively thin copper stock, a material that has a high thermal conductivity, this rotor winding readily conducts the heat generated in it toward the ends of the rotor bars, where the heat is dissipated through the action of malleable iron fans. The rotor bars themselves also constitute a very efficient blower, thus materially increasing the ventilation.

The rotor core is a self-contained unit, and may be pressed on and off the shaft readily, as it has a straight keyway. Otherwise it is largely conventional except that it employs open slots without the usual overhanging tooth tips. Experience has shown that so long as a suitable relation is maintained between the air gap and slot width the performance does not suffer as regards power factor and efficiency and that a rotor core of this construction, with a suitable winding, results in exceptionally high starting and running torques. These

abnormally heavy starting and running torques have led the manufacturers to increase the shaft size above the usual practice for a given rating, which, in combination with the liberal bearings, fabricated from a phosphor bronze, insures exceptionally long life in service.

While great stress has been laid on the mechanical ruggedness of this new line of motors, the electrical characteristics have received equally careful attention. In addition to the exceptional starting and running torques, all motors are guaranteed to carry their full rated load continuously with a temperature rise not exceeding 40 deg. C., and after their ultimate temperature has been reached, to carry 25 per cent overload for 2 hours with a temperature rise not exceeding 55 deg. C. These motors are made in standard industrial sizes, voltages and frequencies.

Thermal Conductivity

Interesting researches have been carried out by the Feather-Stone Insulation Co., of Los Angeles, on the thermal conductivity of what is known as the Feather-Stone insulating brick, manufactured by the company from material obtained from its deposit at Covina, near Los Angeles. The weight per brick is little more than 2½ lb., or 37 lb. per cu.ft. Compressive strength has been calculated at 36 tons per sq.ft. Thermal conductivity amounts to about 1 B.t.u. per sq.ft. per hour per deg. F., which is about one-tenth that of ordinary firebrick. Charts showing the comparative thermal conductivities of Feather-Stone

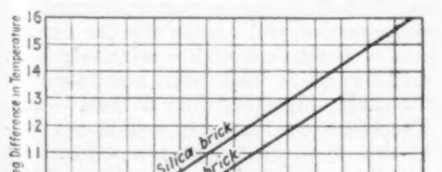


FIG. 1—GRAPH SHOWING THERMAL CONDUCTIVITIES OF VARIOUS TYPES OF BRICK

brick, common red and refractory brick are shown in Fig. 1. Fig. 2 illustrates graphically the relative heat losses through the insulated and uninsulated walls of a furnace.

Thermolith Cement

A new fire cement has been developed by the Harbison-Walker Refractories Co. The trade name given it is Thermolith. It is claimed for this cement that it sets hard and bonds fireclay brick firmly without heat. Fireclay and many other fire cements are incapable of bonding firebrick at ordinary temperatures. Thermolith remains a bond at all working temperatures—extreme heat

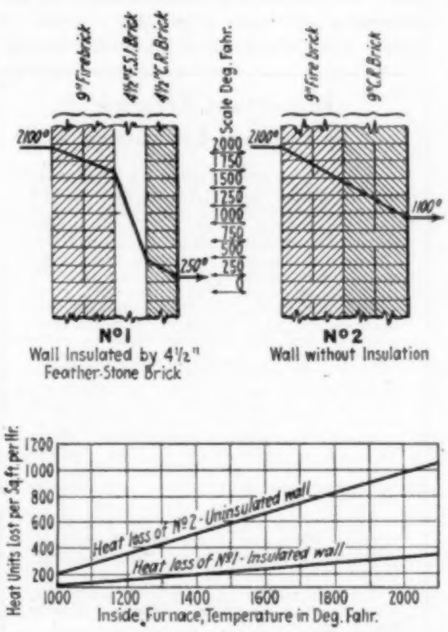


FIG. 2—CROSS-SECTION SKETCHES AND GRAPH SHOWING HEAT LOSS THROUGH INSULATED AND UNINSULATED WALLS

conditions neither fuse it nor crumble it. It is a high-temperature cement and a low-temperature cement. It is also claimed for this cement that it does not flux the brick at any working temperature, because it is chemically neutral. This same quality also enables it to resist the action of slags and clinkers, no matter whether acid or basic. It is mechanically strong. It withstands abrasion, either of furnace charge or mechanical equipment.

Thermal tests which have been conducted show this cement unfused at even the highest working temperatures, and in abrasive tests it has been impervious to sand blasts of sufficient force to wear down fireclay brick. It comes in dry powdered form. It is applied with a trowel after simple mixture with water. It does not require covering with water to prevent deterioration when not in use after the package is opened. It is packed in 200-lb. airtight metal drums.

The cement is recommended by its manufacturers for use in laying up fireclay brick in blast-furnace and blast-furnace stove linings; boiler settings and firebox arches, heating, forge and welding furnaces; copper, lead and zinc furnaces; cement, lime and pottery kilns; gas regenerator linings; glass pot furnaces and glass leers; brass furnaces, and other miscellaneous uses. It is also of great value in patching and repairing fireclay brick construction, such as in boiler and gas-generating practice, where rapid and effective repairs are a requisite for uninterrupted service. This cement is also effectively used as a coating on refractory surfaces for protection against abrasive, corrosive and chemical attack.

Catalogs Received

POWER SPECIALTY CO., New York, N. Y.—Catalog E.C. 100. Descriptive catalog of the Foster Economizer for use in connection with steam boilers.

COOPER HEWITT ELECTRIC CO., Hoboken, N. J.—Various leaflets as follows: Quartz glass apparatus for photophysics and photochemistry, the Lab-Arc, a high tension quartz mercury arc for polarimetry, interferometry, photomicrography, spectrometry, etc. The Uviarc lamp in the laboratory, the ultra-violet lamp, the Uviarc test for dyes, inks, textiles, leather, prints and paper, and Bulletin 105 on Uviarc and Ultra-violet lamps.

NEW JERSEY FOUNDRY & MACHINE CO., 90 West St., New York, N. Y.—Catalog 103, describing a new portable elevator.

GRINNELL CO., Providence, R. I.—Booklet on the Grinnell type tray drier.

SAWYER SPECIALTY SCALES CO., Jacksonville, Fla. Booklet on an accurate system of filling barrels with exact quantity.

QUIGLEY FURNACE SPECIALTIES CO., 26 Cortlandt St., New York, N. Y.—Bulletin 53—Uses of Hytempite. Bulletin 70, the application of Mono-line, a cement for repairing and lining work in foundry practice.

HARDINGE CO., New York.—Bulletin 13. The Hardinge mill for grinding and pulverizing. This bulletin describes new developments in pulverizing and grinding practice and a new type of conical mill put out by this company.

BLAW-KNOX CO., Pittsburgh, Pa.—Catalog on the Batcherplant. A catalog on this company's so-called Batcherplant which is an overhead bin for the storing, measuring, and delivering of materials which are to be used in measured batches.

TRUSCON LABORATORIES, Detroit, Mich.—Leaflet. A quotation from Samuel T. Very's article in a recent issue of *Architecture* on integral waterproofing descriptive of the application of Truscon products.

DE LAVAL STEAM TURBINE CO., Trenton, N. J.—Leaflet. Description of the installation of centrifugal pumps in the Baltimore plant of the American Sugar Refining Company.

Catalogs Wanted

James H. Apps, consulting engineer, 205 Scripps Bldg., San Diego, Calif., desires to receive catalogs covering filters, drying and dehydrating apparatus, cooking kettles—steam jacketed and otherwise—oil-burning apparatus and pressure and exhaust fans.

Cama, Norton & Co., 11 Elphinstone Circle, Bombay, India, invite the receipt of correspondence and catalogs on engineering subjects for which they may have openings in Bombay and India in general.

Synopsis of Recent Literature

World Paper Production

From a recent article in *Paper* we learn that the total production of the existing 2,825 paper mills all over the world in 1913 amounted to approximately 9,750,000 tons and in 1920 the total output of paper and boards was about 14,500,000 tons. The average production of paper per meter-width of paper machines by countries has been estimated as follows: Germany, 540 tons; France, 660 tons; Sweden, 895 tons; England, 910 tons; Norway, 1,000 tons; Finland, 1,240 tons; Japan, 1,630 tons; United States, 1,845 tons; and Canada, 2,200 tons per year. The tons are to be understood as metric tons.

In 1921 the daily capacity of the United States mills was 7,825 tons mechanical, 5,700 tons sulphite, 904 tons sulphate and 1,846 tons soda pulp. During 1921 there was also converted into paper 3,550,000 tons of wood pulp and an unknown quantity of rags. However, the production of 1921 was much less than that of 1920, judging not only from the reported decrease of 846,000 tons of wood pulp but also from the fact that imports were lessened by 206,000 tons as against 1920. This decrease was not confined to the United States alone, as all over the world the same lessened production for 1921 occurred as compared with 1920 and even 1922 did not reach the production of 1920.

Zinc Dust and Its Uses

A. Billaz, in *L'Industrie Chimique*, Aug. 18, 1922, p. 193, notes that those chemical properties of zinc to which it owes its extended use in the powdered state are: (*a*) Reducing properties, which are utilized particularly in dye manufacturing—for example, in the reduction of nitro compounds to organic amines, and in the preparation of sodium hydrosulphite for the reduction of the vat colors; (*b*) the property of precipitating metals, such as copper, cadmium, lead, silver and gold from their solutions. It is used in the purification of zinc sulphate solutions destined for electrolysis or for the manufacture of lithopone, and precipitating gold and silver from their cyanide solutions; (*c*) the property of combining with dry oxygen only at a high temperature, and of giving with moist air a basic carbonate or with sea water an oxychloride which protects the bulk of metal from further alteration. These properties have led to the following applications: Painting iron objects; galvanization by cementation (sherardizing, which consists essentially in immersing iron objects in zinc dust at a temperature of 300 deg. C.); cold or electrolytic galvanizing of cast-iron objects; and metallization, or deposition by projection of a layer of zinc on the surface of the metal to be protected. The industries which use powdered zinc obtain the material from different sources, in accordance with the chemical rôle it has to play. One of these sources is from zinc smelters in which the zinc dust is but a byproduct. It is also made by blowing a stream of gas against a trickle of liquid zinc, and by a little-known pulverization (grinding) process. Zinc dusts are far from being pure zinc; they contain varying amounts of foreign materials, more or less undesirable to the user.

Up to recent years the presence of carbon in zinc dusts was explained solely by mechanical entrainment of the element volatilized from the charge or from the electrodes. Lemarchands (*Revue de la Métallurgie*, December, 1920) drew attention to the relation between the carbon in the dust and the carbon monoxide in the distilling gases, and proposed a chemical origin, depending upon the reduction of the carbon monoxide by the zinc, to the carbon. The main reaction is $Zn+CO=ZnO+C$, but this is modified by two other reactions, $ZnO + CO = Zn + CO_2$ and $CO_2 + C = 2CO$.

The oxidation of the zinc vapors by air is the most general and widely appreciated cause of the formation of zinc oxide contained to the extent of from 6 to 50 per cent. Air exists in the retorts and condensers, from the very commencement of the distillation, and cannot be avoided either in the ordinary furnaces or in the electric furnace. Zinc nitride, Zn_3N_2, the proportion of which in a zinc dust may vary from 0.16 to 0.42 per cent, is also formed from reaction with atmospheric gases.

Microscopic examination shows that grains of zinc dust are metallic globules coated with ZnO crystals; a circumstance which prevents the metallic droplets from wetting each other and uniting with the main body of liquid condensate.

Heated in air, zinc dust, owing to the concentration of oxygen on the surface of the metallic particles, ignites before melting.

Important Articles In Current Literature

More than fifty industrial, technical or scientific periodicals and trade papers are reviewed regularly by the staff of *Chem. & Met.* The articles listed below have been selected from these publications because they represent the most conspicuous themes in contemporary literature, and consequently should be of considerable interest to our readers. Those that are of unusual interest will be published later in abstract in this department; but since it is frequently impossible to prepare a satisfactory abstract of an article, this list will enable our readers to keep abreast of current literature and direct their reading to advantage. The magazines reviewed have all been received within a fortnight of our publication date.

EFFECT OF PULSATION ON FLOW OF GASES. Horace Judd and Donal B. Pheley. *Mechanical Engineering*, April, 1923, pp. 223-228.

DEGREE OF SWELLING AND BEATING. Dr. C. G. Schwalbe. *Paper*, March 14, 1923, pp. 7-10.

DEVELOPMENTS IN PULP AND PAPER INDUSTRY. W. G. MacNaughton. *Paper Trade Journal*, March 22, 1923, Tech. Sec., pp. 49-53.

TRANSFORMATION OF COLOR EQUATIONS FROM ONE SYSTEM TO ANOTHER. H. E. Ives. *Color Trade Journal*, March, 1923, pp. 102-107.

OBTAINING LARGE BLAST-FURNACE PRODUCTION. D. T. Croxton. *Iron Age*, March 29, 1923, pp. 897-900.

EFFECT OF GAS QUALITY ON QUANTITY USED BY CUSTOMERS. Harold Davies, presidential address, Manchester District Institution of Gas Engineers. *Gas Journal* (London), Feb. 28, p. 517.

EXPERIENCE WITH VERTICAL RETORTS. C. F. W. Rendle. *Gas Journal* (London), Feb. 28, p. 529.

SAFETY ENGINEERING IN THE COMPRESSION OF GASES. A. D. Risteen. *Mechanical Engineering*, April, 1923, pp. 242-245.

SOLVING THE REFRACTORIES PROBLEM OF THE NAVY. G. M. Galvin. *Jour. Am. Soc. of Naval Engineers*, February, 1923, pp. 146-152.

FURTHER DATA ON THE EFFECTIVE VOLATILITY OF MOTOR FUELS. Robert E. Wilson and Daniel P. Barnard, 4th. *Jour. Soc. Automotive Engineers*, March, 1923, pp. 287-292.

NEW INTERPRETATION OF EXHAUST-GAS ANALYSIS. E. H. Lockwood. *Jour. Soc. Automotive Engineers*, March, 1923, pp. 299-301.

THE GERMAN BROMINE INDUSTRY. M. Debussy. *Chimie et Industrie*, February, 1923, pp. 245-258.

Temperature Control in Steel Making

Charles Clausel de Coussergues presented a paper on "The Influence of Temperature in Steel Production" before the Liége Congress, June, 1922 (*Revue de Métallurgie*, 1922, pp. 639-644), in which he notes that for a long time one of the desiderata of steel-melting practice was to get the highest possible temperature. However, one now begins to question this statement and to wonder whether a maximum temperature is always to be considered as the best condition for the molten bath.

Consider the basic open-hearth process; it is well-known that an increase in temperature will accelerate the formation of basic slag with a relatively high melting point and will also tend to maintain the slag in a fluid state. Therefore it may be considered advisable to reach a high temperature as rapidly as possible—say above 1,600 deg. C. Such a high temperature will also aid the oxidation of various impurities in the steel, as this is done largely by iron oxide and as the solubility curve of the oxide of iron in iron rises sharply with the temperature, being practically nil at 1,400, about 1 per cent at 1,700 and 3 per cent at 1,800 deg. C.

Such high temperature will, however, hinder dephosphorization. It has been demonstrated some time ago that phosphorus might act as a deoxidizer in presence of carbon if the temperature is not very high. Such, for instance, was the practice of the Décazeville

plant in France in 1902 and 1903 and of the Tsaritzyne works in Russia. The same fact was also pointed out by Howe in his work on steel when referring to the Creusot practice with basic bessemers. It has been said sometimes that on theoretical grounds such a process will prove impossible above the inversion point of the reaction

$$P_2O_5 + 5C = 2P + 5CO,$$

i.e., above 1,100 deg. C. That is, however, in contradiction with practice, and the error seems to lie in the fact that phosphorus does not occur in the bath as phosphoric oxide, but as phosphate.

As it is often advantageous to dephosphorize the bath in the presence of carbon, the process should be conducted at that stage which makes dephosphorization possible—i.e., at a relatively low temperature. Incidentally the lower temperatures will assist in getting rid of iron oxide, as its solubility at lower temperatures is very small.

It follows from these two series of considerations that the molten bath should be superheated first and then somewhat cooled down. Final deoxidation will be effected then at a relatively lower temperature, a smaller amount of oxides will have to be reduced, less deoxidizers will have to be used and a saving in costs obtained.

A New Material for Permanent Magnets

The performance of a permanent magnet depends upon both the remanence and the coercive force. The product of the remanence (*R'*) as determined in a yoke by the coercive force *K*, as measured by a magnetometer, is considered to be a measure of the quality of the magnetic material. It has been shown[1] that, by the addition of manganese to iron, the coercive force was increased to double that of the ordinary chromium or tungsten magnet steel, but that this was accompanied by the reduction of the remanence to a point where the alloy was useless as a permanent magnet. In the present investigation[2] the addition of cobalt, with its known beneficial effect upon the saturation value of iron, was studied by Gumlich. First, three series of alloys with carbon ranges of 0.7 to 0.8 per cent, 1.0 to 1.1 per cent and 1.2 to 1.4 per cent containing from 3 to 11 per cent Mn, and with Co about 35 per cent, were made up. It was soon found that there was no advantage in going over 4 per cent in Mn. The best alloys of these series were found to be (H max. 500):

	%C	%Mn	%Co	*R'*	*K*	$R' \times K \times 10^{-}$
(1)	0.83	4.8	35	9530	158	1505
(2)	1.12	4.7	35	9580	156.3	1497
(3)	1.24	4.0	35	9720	132.3	1285

The best heat-treatment was found to be quenching in ice-cooled oil from 850 deg. C.

The addition of cobalt in any lower proportion than 33 per cent caused rapid falling off in both *R'* and *K*.

In another series chromium was added to determine in what degree this element could be used as a substitute for the expensive cobalt. It was found that 5 per cent Cr could be substituted for 10 per cent of cobalt without appreciably altering the magnetic properties, provided the carbon was kept around 1.1 per cent. If, however, the Co was kept at 35 per cent and 5 per cent Cr added, very much better results were obtained, as, for comparison (H max. 500):

	%C	%Mn	%Co	%*Cr*	*R'*	*K*	$R' \times K \times 10^{-3}$
(2)	1.12	4.7	35	....	9580	156.3	1497
(4)	1.11	..5	20	5.1	9430	155.0	1460
(5)	1.11	3.5	36	4.8	9130	203.8	1863

In these higher coercive force alloys it is necessary to use higher magnetizing forces than in ordinary magnet steels. Fields up to 1110 H max. were tried and gave increasingly good results. *R'* and *K* were boosted to 9310 and 227 respectively, as compared with 9130 and 203 at H max. = 500.

With high Cr, Co and C (alloy 5), it was necessary to increase the hardening temperature to 875 deg. C. Under aging, hammering and heating tests these alloys showed little change, the maximum being 3½ per cent due to heating to 100 deg. C. The temperature coefficient (20 to 100 deg. C.) was found to be 204×10^{-6}, which is about the same as our present Cr and W steels.

[1] *Electrotech. Zeitschrift,* vol. 40, p. 26 (1919).

[2] G. Gumlich, *Electrotech. Zeitschrift,* vol. 44, pp. 147-51, Feb. 15, 1923.

Corrosion of Metals by Refrigeration Brine

Results of a study to determine causes and methods of overcoming corrosion in refrigeration brine systems by Emerson P. Poste and Max Donauer, of the Research Laboratories, Elyria Enameled Products Co., are summarized in *The Mills Dealer* for February.

Three types of brine were found in commercial use: Natural calcium chloride, soda byproduct calcium chloride, sodium chloride. The latter is not used to any extent, as it is of a severely corrosive nature, probably due to an induced oxidation. Analyses of the two types of calcium chloride are as follows:

	Natural Per Cent	Soda Byproduct, Per Cent
Calcium chloride........	73.59	74.07
Sodium chloride...........	1 45	0.51
Magnesium chloride.......	0.00	0.00
Total solids...............	75.11	74.66
Water......................	24.89	25.34

To determine the effect of acidity and alkalinity on rate of corrosion, tests were made with a brine of commercially pure calcium chloride treated with lime and acid to produce a range of from the equivalent of 0.5 per cent free calcium hydroxide to 0.3 per cent free HCl. The curve indicates that to keep corrosion at a minimum the alkalinity must be greater than 0.1 per cent. Brines originally alkaline will turn acid gradually, and a curve showing the rate in days plotted against original alkalinity was also determined. As in the first curve, the break in the curve comes at a free lime content of 0.1 per cent. Rate of corrosion was also found to decrease with the density of the brine.

These and other findings may be summarized as follows: Essentially pure calcium chloride brine is alkaline when first made, but it soon turns acid on exposure to air, due to absorption of carbon dioxide. With this acidity comes a marked increase in corrosive action. The activity is materially increased in the presence of magnesium chloride as a result of the earlier development of acidity and the formation of corrosive ammonium chloride in the case of ammonia leakage. Contact of unlike metals or the presence of stray electrical currents increases the rate of corrosion of a pure brine and the presence of the above impurities accelerates these electrical tendencies. The corrosive action of brine decreases with increasing brine density. Chlorides are on the market which are contaminated with magnesium chlorides, though first-class materials are available, both soda byproduct and natural chlorides. Corrosive brines free from magnesium chlorides may be corrected by treatment with lime if the alkalinity produced is maintained above 0.1 per cent. This is readily done by keeping a supply of lime in a bag hung in the brine tank.

Wear on Rails

According to M. J. Gouttier, in *Revue Universelle des Mines*, vol. 11, p. 524, the Sandberg sorbitic process of improving rails—used to a certain extent in England—has been lately applied by a traction line in Paris. Owing to the increase of the volume of the traffic and of the weight of the cars, the rails were being subjected to a more severe strain and are wearing down more rapidly than ever before. Investigations were set on foot to find a remedy. First it was thought best to alter the section of the rail. Another line of research was the question of using nickel steels, but their price proved prohibitive. The manganese and high-carbon steels were also studied.

Steel rails containing 0.5 per cent C, 0.3 per cent Si and 1.1 per cent Mn, treated by the Sandberg process, gave very good resistance to wear and were not expensive.

The Sandberg sorbitic process is applicable to the treatment of all similar articles where hardness and toughness are required. There are obvious objections to hardening rails by quenching. It is only necessary that the rails should be tough and hard. Therefore the rails, when still at a temperature above the critical range, are cooled by a blast of air or atomized fluid so as to cool them with a moderate speed through the critical range and obtain finally a sorbitic structure. By this treatment an increase of 10 to 15 per cent of tensile strength and of 20 to 25 per cent of elastic limit is easily had. Elongation is, of course, a little reduced and the Brinell hardness increased by 20 to 25 per cent. Resistance to abrasion is also raised very considerably.

The process has been developed to the treatment of rails *in situ*, by drawing a high temperature flame along the surface of the rail and then flooding the hot surface by a water jet.

Review of Recent Patents

Gas-Flow Meter—Charles W. Hinman has been granted a patent for a gas-flow meter which uses the heat interchange system for indicating the rate of gas flow. The method and apparatus are patented. The method consists of abstracting from the gas the quantity of heat resulting from the fixed diminution of temperature of the gas between inlet and outlet, producing in the abstracting fluid (water) a fixed temperature difference between inlet and outlet. The water flow is thus indicative of the rate of gas flow, due account being taken of the specific heats and temperature differences involved. (1,446,461. Feb. 27, 1923.)

Process for Treating Paper Mill Waste—J. E. Plumstead has assigned to the Jessup & Moore Paper Co., of Philadelphia, a process for recovering the soluble salts and the combined carbon in pulp mill waste liquor. This is done by passing first through an incinerating evaporator that takes off all the water, some of the chemicals and gases formed and reduces the combined carbon to a char. The resulting mixture of carbon and chemicals is treated with water in a dissolving tank, ground up finely and filtered. The carbon sludge which is thus obtained is dried and ground again and finally used as pulverized fuel. The hot gases are treated in a scrubbing system to remove any valuable products before allowing them to escape. (1,442,494. Jan. 16, 1923.)

Electrical Precipitation of Flocculent Material—This invention is concerned with the electrical precipitation of suspended materials from gases, when the suspended materials are of a light, flocculent nature such as soot or carbon smoke. In order to overcome the difficulty of precipitation of such materials, a solid, pulverulent material of a coarser, heavier nature than the material which it is desired to precipitate is distributed into the gas. This heavier material serves to form with the light, flocculent material a compact and granular mass easy of precipitation.

In operation, a suitable weighting and granulating medium, such as finely divided clay, fullers earth, soapstone, sand, cement, kiln flue dust or finely divided rock or earth of any kind which is heavier and more compact than the deposit which would be formed by precipitation of the material suspended in the gases is injected into the stream of gases passing to the electrical precipitator so as to become thoroughly distributed throughout the body of gases. This may be effected by injecting such finely divided solid material into the gas stream by blowing it in with a current of air, or steam, or other gas, or a mechanical distributing apparatus.

As the gas is then passed through the electrical precipitator and is subjected to the action of an electrical field produced between discharge and collecting electrodes, the material suspended in the gases, including the weighting and granulating agent aforesaid, is deposited on the collecting electrodes, and is removed from such electrodes from time to time by jarring, brushing or otherwise. By reason of the weighting and granulating effect of the material added to the gases and deposited along with the material originally suspended in the gases, the material so precipitated will remain on the electrodes instead of being carried along by the gases.

This is of especial importance in the case of gases where the precipitated material includes more or less soot. It has been found that in the precipitation of such material there is a tendency for the light, flocculent soot particles to be carried along by the

American Patents Issued March 20 and 27, 1923

The following numbers have been selected from the latest available issue of the *Official Gazette* of the United States Patent Office because they appear to have pertinent interest for *Chem. & Met.* readers. They will be studied later by *Chem. & Met.'s* staff and those which, in our judgment, are most worthy will be published in abstract. It is recognized that we cannot always anticipate our readers' interests and accordingly this advance list is published for the benefit of those who may not care to await our judgment and synopsis.

1,448,846—Process for Making a Composition for Purifying Liquids. Walter L. Jordan, New York.

1,448,847—Sizing Composition. Reuben Kaiser, New York, N. Y., assignor to T. M. Duché & Sons, New York.

1,448,869—Varnish. Pincus Rothberg, Summit, N. J., and Albert Parsons Sachs, New York.

1,448,901—Gas-Analysis Machine. Frederick A. Moreland, Chicago, Ill.

1,449,067—Manufacture of Ink. Walter O. Snelling, Allentown, Pa.

1,449,102-113—Processes for the Manufacture of Yeast. Friedrich Hayduck, Wilmersdorf, Germany, assignor to the Fleischmann Co., New York.

1,449,114—Foam-Destroying Device. Friedrich Hayduck, Wilmersdorf, Germany, assignor to the Fleischmann Co., New York.

1,449,121—Process of Producing Carvacrol and Thymol. Ralph H. McKee, New York.

1,449,127—Process for Producing Yeast. Martin Nilsson and Norman S. Harrison, Peekskill, N. Y., assignors to the Fleischmann Co., New York.

1,449,134—Method of Treating Molasses. Alfred Wohl, Danzig-Langfuhr, free city of Danzig, assignor to the Fleischmann Co., New York.

1,449,135—Method of Washing Compressed Yeast. Alfred Wohl, Danzig-Langfuhr, free city of Danzig, assignor to the Fleischmann Co., New York.

1,449,156—Solvent Composition. Herman F. Willkie, Baltimore, Md., assignor to U. S. Industrial Alcohol Co.

1,449,157—Enameling Composition. Herman F. Willkie, Baltimore, Md., assignor to U. S. Industrial Alcohol Co.

1,449,169—Apparatus for Producing, Separating, and Feeding Powdered Coal. Ernst H. Elzemeyer and Paul S. Knittel, St. Louis, Mo.

1,449,226-227—Process of Cracking Hydrocarbon Oils Under Pressure to Produce a Low-Boiling-Point Oil or Fraction. Richard W. Hanna, William D. Mason and Walter G. Hamilton, Richmond, Calif., assignors to Standard Oil Co., San Francisco.

1,449,330—Cleaning Composition. Sever P. Killy, Kansas City, Mo., assignor to John O. Lytle and Charles G. Edgerton, Sugar City, Colo.

1,449,373—Corrosion-Resistant Alloy. Wesley J. Beck and James A. Aupperle, Middletown, Ohio, assignors to the American Rolling Mill Co., Middletown, Ohio.

1,449,379—Lubricating Compound. Samuel A. Bullock, New York, N. Y., assignor to Ally Co., Inc., New York.

1,449,380—Manufacture of Threads, Filaments, Strips or Films of Cellulose. Michel Teodor Callimachi, London, England, assignor to Courtaulds, Ltd., London.

1,449,388—Paint and Varnish Removing Composition. Ida A. Ferrell, Staunton, Ind.

1,449,423—Production of Naphthylamines. Alexander Lowy and Arthur Mark Howald, Pittsburgh, Pa.

1,449,493—Process of Treating Rubber and Product Obtained Thereby. Sidney M. Cadwell, Leonia, N. J., assignor to the Naugatuck Chemical Co., Naugatuck, Conn.

1,449,603—Method of Separating Granular Solid Material. Martin Hokanson, Duluth, Minn.

1,449,613—Wool Cleaning. Hiram Young McBride, Denver, Colo.

1,449,681—Sulphur Dye. Erwin Kramer, Dentz, near Cologne, and Ludwig Zeh, Wiesdorf, near Cologne, Germany, assignors to Farbenfabriken vorm. Friedr. Bayer & Co., Leverkusen.

1,449,718—Art of Rendering Paper Material Greaseproof. Wilbur L. Wright, Fulton, N. Y.

1,449,793—Glass and Process of Making Same. William Chittenden Taylor, Corning, N. Y., assignor to Corning Glass Works.

1,449,875—Apparatus for Hydrogenerating Carbonaceous Material. Titus Ulke, Washington, D. C.

1,449,892—Sizing Composition and Process of Preparing the Same. Philip W. Codwise, Dalton, Mass.

1,449,930—Machine for Treating Rubber and Other Heavy Plastic Material. Fernley H. Banbury, Ansonia, Conn., assignor to Birmingham Iron Foundry, Derby, Conn.

1,449,976—Oil Product and Process of Making Same. Henry V. Dunham, Mount Vernon, N. Y.

1,449,981—Method of Indigo Dyeing. Edward T. Garsed, Charlotte, N. C., assignor to Alexander & Garsed, Inc., Charlotte, Inc.

1,450,026—Process for the Manufacture of Lubricants From Low-Temperature Tar. Egon Eichwald and Hans Edgar Richard Vogel, Hamburg, Germany.

1,450,078—Valve for Corrosive Liquids. Charles F. Haunz, Buffalo, N. Y., assignor of one-half to Theodore Krug, Buffalo.

Complete specifications of any United States patent may be obtained by remitting 10c. to the Commissioner of Patents, Washington, D. C.

gas stream because they do not form a compact adherent deposit on the electrodes, but either fail to adhere, or adhere only loosely to the electrodes, and are easily swept along by the gas stream. The dust, clay or other solid finely divided material, when precipitated along with the soot, forms a heavy more or less compact and granular deposit which adheres to the electrodes sufficiently to prevent being swept along with the gases, but can be readily dislodged by jarring or brushing, and when so dislodged will fall by gravity into the collecting means in the bottom of the precipitator. (1,446,778. Gustav A. Witte, assignor to International Precipitation Co., of Los Angeles, Calif. Feb. 27, 1923.)

Process for Making Sulphates—Harry Pauling, of Berlin, Germany, has developed a process for making sulphates. It consists essentially in treating the metal with nitric acid, about 50 per cent strength. The acid is slightly warmed in order to start the reaction and a rapid evolution of nitric acid takes place. These gases are absorbed in suitable absorption towers, which may be operated in such a manner that the nitric acid is regenerated to the same strength at which the operation started. At the end of the reaction a solution of the nitrate of the metal is treated in another vessel with sulphuric acid. The nitric acid set free in this reaction is also recovered in the absorption chamber. Air is forced through the solution in order to free it from nitric acid. The resulting solution of copper sulphate may be crystallized by cooling.

The distinct advantages of this process lie in the fact that a very rapid reaction is effected with no loss of the intermediate agent—nitric acid. Formerly, sulphuric acid was run down through towers over copper or zinc, or nickel, or whichever metal was to be used, and the solution collected at the bottom. This particular method is much more rapid and gives the material a high purity. (1,446,578. Feb. 27, 1923.)

Calcium Carbide Production—In U. S. patent 1,327,736 a claim was made for a process of producing calcium carbide from coking coal and lime mixed in proportions to form a cokelike mass and then subjected to the action of heat to convert it into carbide. It was stated in the specification that calcium oxide or calcium carbonate may be used with the bituminous coal when calcium carbide is the ultimate product desired. In a later patent (1,396,058) a cemented mixture of oxide and carbon made by the intimate mixture of lime and bituminous coal, heated to form a homogeneous mixture, was used as the raw material. It is stated in the present patent that a satisfactory product is obtained by intimately mixing equal parts by weight of calcium carbonate ground to about 40 mesh fineness with bituminous coal ground to about 8 mesh fineness. This mixture is subjected to heat sufficient to distill the coal. The heating may be performed in an ordinary gas retort or furnace. At about 600 deg. F. the tarry products are liberated and as the heating proceeds further, these bubble through the mass of material, thereby coating and impregnating each lime particle with hydrocarbon, which, under the influence of heat, is converted into coke or carbon. The action of the tarry products and the presence of an excess of carbon prevents the conversion of the calcium carbonate into the oxide (assuming the lime ingredient used is the carbonate). At the conclusion of the operation, a cemented mass of coke and limestone is obtained, which is of uniform composition throughout and which forms an ideal resistor to the passage of electric current in a carbide furnace. This raw material will not deteriorate, even though it is exposed to the action of the water. Hence it can be stored indefinitely and handled with convenience in the shipping. Furthermore, the limestone supplies not only the necessary calcium oxide, but has a fluxing effect which enables the reaction to be realized in a particularly efficient manner. (1,445,644. James H. Reid, assignor to International Nitrogen Co., Cleveland. Feb. 20, 1923.)

Organic Arsenic Compound—A new arsenic compound having the formula $As(OH)_2OCH_2COOH$ can be obtained by the interaction of chloracetic acid with arsenic oxide, As_2O_3, or its derivatives, provided the reaction takes place in the presence of an alkali. An example of how the material is produced is as follows: 198 parts of arsenic oxide (As_2O_3) are dissolved in 330 parts of sodium hydroxide and 700 parts of water. Subsequently 273.5 parts of chloracetic acid ($ClCH_2COOH$) are dissolved in a cold solution of 130 parts of caustic soda in 130 parts of water. The latter solution is then added while stirring to the solution of arsenic. After the reaction is complete the mixture is neutralized with acetic acid and rendered alkaline with a surplus of ammonia. By the addition of calcium chloride the calcium salt of the acetic arsenic acid is precipitated, filtered off and dried. The resulting compound is said to have therapeutic value. Johann Huismann and Jurgen Callsen, assignors to Farben-Fabriken vorm. Friedr. Bayer & Co., of Leverkusen, Germany (1,445,685. Feb. 20, 1923.)

Production of Cellulose Ethers—The present process in the manufacture of cellulose ethers is considerably accelerated by a method patented by Leon Lilienfeld, of Podhajce, Poland. Instead of washing out the alkali from the alkali cellulose, which is formed as an intermediate product in the ordinary process of manufacture, by this method the agent for conversion of the alkali cellulose to the ether is added before getting rid of the caustic. This does away with the pressing, centrifuging or like operations which have previously been necessary. The alkylating, aralkylating or arylating agent is added immediately after the caustic solution has acted upon the cellulose. (1,441,989. Jan. 9, 1923.)

British Patents

For complete specifications of any British patent apply to the Superintendent British Patent Office, Southampton Buildings Chancery Lane, London, England.

Pickling—In order to avoid brittleness in pickled iron or iron alloys, organic bases containing nitrogen rings, especially the quinoline nucleus, are added to any usual pickling bath, which may comprise sulphuric acid of 5 per cent strength for hot pickling, or hydrochloric acid of 10 to 20 per cent strength for cold pickling, and 1 to 2 per cent of the nitrogen compound. Extracts from the distillation products of coal tar or fractions of coal-tar distillates which contain the bases, or synthetic products may be used. Specification 158,768 is referred to. (Br. Pat. 188,713. British and Foreign Chemical Producers, Ltd., London. Jan. 10, 1923.)

Refining Lead—Oxidizable impurities such as arsenic, antimony, tin and zinc, are removed from lead by bringing the molten lead into contact with an oxidizing agent such as alkali nitrate, nitrite, chlorate or hypochlorite, or a peroxide, in suspension or solution in molten caustic alkali, or caustic alkali and a fusible chloride. The molten metal is preferably passed through the reagent by means of the apparatus described in specification 142,398 or 184,639. The temperature and the proportion of oxidizing agent may be so adjusted that different impurities are removed in succession. (Br. Pat. 189,013. H. Harris, London. Jan. 10, 1923.)

Artificial Silk—For purifying viscose and similar cellulose solutions to be used in the manufacture of artificial silk, the solution is emulsified with an organic liquid such as paraffine, which does not dissolve in the solution; on standing, the emulsion separates into layers, and the organic liquid carries with it the suspended particles and a portion of the resinous and coloring impurities of the viscose solution. Separation may be accelerated by passing the emulsion through a centrifugal separator. Subsequent filtration is unnecessary. (Br. Pat. 189,114; not yet accepted. J. R. N. van Kregten, assignor to Naamlooze Vennootschap Nederlandsche Kunstzijdefabriek, Arnhem, Holland. Jan. 17, 1923.)

Activated Carbon—Decolorizing carbon is produced from carbonaceous material of vegetable, animal or mineral origin, by dry distillation in presence of activating gases or other substances with or without a preliminary distillation together with inert or slightly active gases. The gases, which may be chlorine, volatile chlorides, air, steam, carbon dioxide or monoxide, flue or generator gases, or mixtures of these gases, are passed through the charge in a direction opposite to that of the charge itself. The other activating substances specified are calcium or magnesium carbonates and chlorides, slaked or unslaked lime or "liquids or gases." The raw materials such as wood waste, peat, waste cellulose, lignite, briquetted coal, etc., is charged into a retort, preferably

vertical or inclined, and the active gas, preferably at 100 to 600 deg. C., is introduced at the other end. The temperature of the retort is controlled by means of the gases so that it rises to a maximum and then decreases. Various temperatures are specified for the activation by the different gases. The retort gases produced are preferably removed at a short distance from one end of the retort, to obviate the choking of the conduit by the cooled products, and may be utilized to heat the retort. The product may be ground and purified by treatment with hydrochloric acid or "other chemicals." (Br. Pat. 189,148; not yet accepted. General Norit Co., Ltd., Amsterdam. Jan. 17, 1923.)

Ammonia Recovery—Ammonia is recovered from producer gas, distillation gases and other gases containing a small amount of ammonia. The gas is passed through carbonaceous material containing organic acids such as soft lignite or peat, and the invention may be carried out in conjunction with the manufacture of producer gas from peat, lignite or similar material. The ammonia is liberated by means of alkali and the absorption material is regenerated by treating with an acid such as hydrochloric and removing the excess acid. (Br. Pat. 191,741. Industrial Research, Ltd., London. March 7, 1923.)

Insulating Varnish—Fatty acids are heated with either the gelatinized product formed by heating a vegetable oil with or without resin, or a mixture of glycerine and resin with or without vegetable oil. The heating is continued until the ingredients are thoroughly mixed and are on the point of gelatinizing. The compositions, with or without dilution with solvents such as kerosene, are used as varnishes and are further heated after application to cause them to solidify. Suitable fatty acids are those obtained from drying and semi-drying oils such as linseed, Chinese wood, corn, cottonseed, soya bean, peanut, sesame, rapeseed, castor oil and tung oils. Suitable resins are shellac and Congo copal. The products are particularly applicable for japanning or enamelling electric conductors and other metallic surfaces for insulating and protective purposes. (Br. Pat. 191,422; Western Electric Co., Ltd., Norfolk House, Victoria Embankment, Westminster. March 7, 1923.)

Men in the Profession

Dr. FRANK APP has resigned from the staff of the Agricultural College and Experiment Station of Rutgers College to become vice-president of the Minch Brothers Co., at Bridgeton, N. J.

HENRY H. BUCKMAN, formerly head of Buckman & Pritchard, Inc., New York, producer of zircon, etc., will operate as a chemical engineer in raw materials and manufactures, with headquarters at Jacksonville, Fla.

WILLIAM I. BURT, formerly sales engineer of the Bristol Co., is now chief chemist of the Dolomite Products Co., Maple Grove, Ohio.

Dr. ARTHUR HOLLY COMPTON, head of the department of physics in Washington University, has been appointed professor of physics at the University of Chicago.

Dr. CECIL H. DESCH, professor and dean of the faculty of metallurgy in the University of Sheffield, delivered recently the "Second Sorby Lecture" on "The Services of Henry Clifton Sorby to Metallurgy." The Sorby lectureship has been instituted by Sheffield engineering associations to commemorate the work of Dr. Sorby, who rendered signal service to metallurgy and to microscopy.

W. A. DUNKLEY has resigned his position as gas engineer at the Urbana Station of the Bureau of Mines to become superintendent of the gas department of the Memphis (Tenn.) Power & Light Co.

EDWARD CURTIS FRANKLIN, president of the American Chemical Society and professor of organic chemistry in Leland Stanford University, addressed the Pittsburgh Section of the society in the auditorium of the U. S. Bureau of Mines on March 26. His subject was the "Ammonia System of Compounds," although it might be termed as a discussion of the analogy of ammonia to water. A number of interesting experiments were made.

CHARLES W. FRANCIS is now superintendent of the Lennox Chemical Co., Euclid, Ohio.

JOHN HAYS HAMMOND has endowed a scholarship in engineering at Yale University for a Mexican student. The scholarship is for a 4-year course and covers expenses of tuition, dormitory, meals, books, etc., and also transportation from and to Mexican border.

Dr. A. P. HOLLEMAN of the University of Amsterdam, Holland, will lecture, April 13, at 4 p.m. in the Doremus Lecture Theater, Chemistry Building, College of the City of New York.

Dr. IRA N. HOLLIS, for 10 years president of Worcester Polytechnic Institute and previously professor of engineering at Harvard University, has offered his resignation to the board of trustees.

A. C. HOUGHTON, who for the past 18 years has been associated with the Semet Solvay Co., has entered the employ of the Bakelite Co., of New York City. Mr. Houghton will erect and operate a phenol plant for that company near Cleveland, Ohio.

FRANK HOYER, formerly with the General Chemical Co., Buffalo, N. Y., has become an instructor in chemistry at the Hutchinson High School, Buffalo. Mr. Hoyer will spend part of his vacation with the General Chemical Co.

Dr. J. C. KARCHER of the sound laboratory, Bureau of Standards, has resigned to accept a position as technical adviser to the production manager of the Western Electric Co., Chicago, Ill.

CHESTER H. PENNING accepted an appointment as special expert with the chemical staff of the U. S. Tariff Commission, and assumed his duties in Washington about the middle of March.

HARRY STEBBINS, of Powers-Weightman-Rosengarten Co., has accepted the chairmanship of the fine chemicals division in the forthcoming Home Service Appeal of the Salvation Army for a fund to maintain and extend its activities in Greater New York.

E. T. STOTESBURY has been elected president of the Temple Iron Co., Reading, Pa.

Obituary

Sir JAMES DEWAR, the famous British chemist, who was the co-inventor with Sir Frederick Abel of cordite, the smokeless powder adopted by the government, died on March 27, in his eighty-first year. He also brought forward the Dewar flask, popularly known as the thermos flask. Sir James Dewar was born in Kincardine-on-Forth, prepared for college at the Dollar Academy and went to Edinburgh University, where he specialized in chemistry. On his graduation he became the assistant to Lord Mayfair, then occupying the chair of chemistry at Edinburgh University. Devoting himself to research the greater part of his long life, Sir James Dewar's investigations in the field of chemistry covered a wide range. Especially well known were the following among his investigations: Physiological action of light; problems of spectroscopy; liquefaction of gases; the scientific use of liquid oxygen, air, fluorine and hydrogen. For a time he was director of the Davy-Faraday Research Laboratory, and he held professorships at St. Peter's College, Cambridge, and was also Jacksonian professor of experimental philosophy at Cambridge. He was knighted in 1904.

GUSTAVUS DETLEF HINRICHS, forformerly professor of physical science at the State University of Iowa and of chemistry at the St. Louis College of Pharmacy, is dead, at the age of 77.

CHARLES M. MACNEILL, president of the Utah Copper Co. and the Chino Copper Co. and vice-president of the Replogle Steel Co., died of pneumonia on March 17, at his home in New York, at the age of 52. He was ill less than 2 days. When 33 years of age he was elected president of the Utah Mining Co. and had been prominent in the copper industry since that time.

The Week in

Industry and Trade

Current News and Market Developments

News Section

April 9, 1923
CHEMICAL & METALLURGICAL ENGINEERING
Tenth Avenue at 36th Street, New York
H. C. PARMELEE, *Editor*

Market Section

The Summary of the Week

The advance in phenol, together with prospects for a higher contract market, has stimulated the trade to such an extent that new production is under consideration in several quarters.

The Salesmen's Association of the American Chemical Industry has appointed a committee to draw up a uniform contract to govern transactions in chemicals.

Soap makers absorbed more than 1,000,000 lb. of extra tallow at 9c. per pound.

Heavy arrivals of arsenic from Japan reached the market during the week, but were readily absorbed.

Muriate of potash is very firm due to difficulty in securing stocks from Germany, and other potash salts are firm as a result.

Higher average price for tin caused advances in tin products at the beginning of the month, but tin oxide eased off in price during the week.

Reports from Germany say that American buyers of chemicals are no longer active in German markets owing to the unsatisfactory result of previous business.

The Interstate Commerce Commission has refused to allow Western transcontinental railroads to reduce freight rates on oils from the Pacific coast to Chicago.

Permanganate of potash attracted considerable interest, but actual business was not heavy, as stocks are limited.

Bleaching powder has been finding a good outlet in consuming trades, and some producers are sold up.

Completing the Circle

THIS is the first issue of *Chem. & Met.* which contains this new department, "Industry and Trade." It is a new effort and will be a permanent addition to our service.

This department is built for every man in the chemical engineering industries. Whether his work be executive, operating, purchasing or selling, this department is his. He will naturally use it with different emphasis depending on his needs, but he will use it. Behind this constructive effort is a desire to serve all phases of the chemical engineering industries—production, management and marketing. The prestige that *Chem. & Met.* has earned as the leading technical paper in the field is a promise that its effort in marketing will be constructive and distinguished.

It has been more than a year since Herbert Hoover, acting as a spokesman and a critic of industry, said that the greatest effort of business in the next decade would be to diminish the slack and waste in distribution. That is the job of every business man. How is he to undertake it? What manner of effort must be made? Will it be accomplished by the single act of a genius? Probably not. It is a task for every one of us.

Distribution efficiency or marketing efficiency must be based first on a knowledge of markets. This includes current prices, and these *Chem. & Met.* will give you weekly. Accurate prices they are, compiled by men with long experience and a wide acquaintance, men who know accurate prices and who know where to get them.

Knowledge of markets must also include an understanding of the price changes that are likely to occur. Whether these changes are cyclical and dependent on seasonal demand or whether they are due to some unusual factors, they must be anticipated and interpreted by experts in that work. This *Chem. & Met.* will do through "Industry and Trade."

Again, knowledge of markets must include acquaintance with the trends of business. The post-war deflation taught us that lesson. The economics of business, the general movements toward depression or boom are not apparent from the day's work and can be sensed only by those who can get a perspective on conditions. In *Chem. & Met.* it is possible for us to focus the statistics from hundreds of sources into a balanced point of view on business conditions.

Imports and foreign prices are indications of the severity of foreign competition, and these will both be covered. Notes on corporations and industrials, reports of decreased or increased production, personal items indicating a greater or smaller emphasis on various phases of a company's business—all of these things paint a composite picture of business during the week.

This department will be *Chem. & Met.'s* contribution to better efficiency in marketing.

There is yet another side of this work that is important. In this department will be a record of important events in industry and trade. Not only is this department a market service to the industry but it is the newspaper of the industry. Able editors in New York, Chicago, Washington and San Francisco, constant editorial contact with industrial centers through trips and scores of correspondents in larger centers of activity make possible a news service that is unique.

H. C. Parmelee

Technical Societies and Trade Associations

News of the Week

Current Events Legislative Progress

Chemistry by radio is one of the latest wrinkles in popular education. Certain A.C.S. sections have already broadcast entertaining programs of chemistry with success. The New York Section is now planning a series of five or six lectures of popular interest which are to be wirelessed from the New York station WEAF. Subjects and speakers will be announced in the near future.

Gold and silver data are ready to be laid before the special Senate committee investigating the status of these industries. Various agencies have been active in assembling these data; the committee representing the mining congress expresses hope that the outcome of the investigation may greatly benefit the entire nation.

Prohibition of naval stores exportation from France is urged by various of her manufacturing syndicates which claim that the low stocks now in hand are fast being depleted by foreign purchasers. Rosin and turpentine are the commodities most affected.

New York's garbage problem is becoming serious. A study is being urged to find an improved method of disposing of the 3,700,000 tons of waste which has to be removed annually. Present methods involve both waste and a menace to health.

Education in leather is the aim of a campaign just launched, which is to be financed by the American Sole & Belting Leather Tanners, Inc. Various organizations are co-operating in this campaign to show the public what factors enter into leather manufacture and so influence costs to consumer.

The Austrian glass industry is tottering. Its wares cannot be placed on home or foreign markets. German and Czechoslovakian competitors are underselling Austrian firms by 40 to 50 per cent.

Soap going into Cuba from other countries than America is liable to new duties if a movement now on foot is carried through. Cuba makes most of her laundry and floating soap using much imported raw material, but has in the past imported toilet and perfumed soaps from Europe. The new measure would effectively stop this importing.

French metal industry is slowing down. An order has just been received here for 1,000,000 tons of American coal. The present supply of coke is very low. Almost none comes from the Ruhr. Several concerns are facing the suspension of all operations.

A unique service to paint men is being rendered by Spencer Kellogg & Sons, Inc., of Buffalo, N. Y. This firm, manufacturer of vegetable oils and oil products, is offering the services of an expert on linseed oil to speak before any master painters' association in the United States.

Calendar

The following important technical meetings are scheduled for the immediate future:

AMERICAN ASSN. OF ENGINEERS Norfolk, May 7-9

AMERICAN ELECTROCHEMICAL SOCIETY New York City, May 3-5

AMER. SOCIETY MECHANICAL ENGRS. Montreal, May 28-31

AMERICAN FOUNDRYMEN'S ASSOCIATION Cleveland, O., April 28-May 4

AMERICAN OIL CHEMISTS' SOCIETY Hot Springs, Ark., April 30-May 1

AMERICAN WELDING SOCIETY New York, April 24-27

AMERICAN ZINC INSTITUTE St. Louis, May 7-8

CANADIAN INSTITUTE OF CHEMISTRY Toronto, May 29-31

INTERSTATE COTTON SEED CRUSHERS ASSN. Hot Springs, Ark., May 2-5

SOCIETY OF CHEMICAL INDUSTRY Canadian Section Toronto, May 29-31

SOCIETY OF INDUSTRIAL ENGINEERS Cincinnati, O, April 18-20

SOCIETY OF CHEMICAL INDUSTRY New York, joint meeting with other societies, April 13

Six million cords of pulpwood was consumed by United States pulp mills in the banner year, 1920. A recent report of O. M. Porter of the American Pulp and Paper Association states that last year fires destroyed enough wood to keep our mills running for 18 months at this rate. Budworms are destroying an average of 10,000,000 cords a year in Quebec alone.

The sisal inquiry of the government has been placed in charge of P. L. Van Buren Bell, who has been appointed by Secretary Hoover. Mr. Bell is to look into the situation on the ground with especial reference to the control of the Yucatan crop.

Colombia and Brazil urge American investigation of their rubber resources. The Ministers of these countries have issued statements in which co-operation in a study of the situation is promised. Willingness on the part of these countries to have the United States develop its own rubber industry within their bounds seems manifest.

Acetylene and oxygen, purified and mixed, roughly 40 per cent of the former to 60 per cent of the latter, constitute a new anæsthetic. Its discoverer, Prof. K. Gaus, has named the mixture narcylene. The objectionable odor of the acetylene is overcome by the addition of pine oil.

Federal Phosphorus Co. Not to Produce Arsenate

The Federal Phosphorus Co. is not to engage in the manufacture of calcium arsenate. Theodore Swann, president of the company, has notified *Chem. & Met.* that the statement appearing in last week's issue to the opposite effect is in error.

Tariff Investigation Organized

Schedules asking information regarding costs of production and other data have been mailed by the Tariff Commission to domestic producers of the seven chemicals regarding which the commission has undertaken investigations looking toward changes in duties under the flexible tariff section of the new act.

The commission has approved plans by which F. W. McSparren, of the chemical section, and an accountant not yet selected will sail for Argentina April 14 to investigate costs of production and other competitive conditions of casein in the South American republic, which is the largest exporter to the United States, and by which C. R. DeLong, chief of the section, and M. G. Donk, an assistant, and an accountant will sail for Europe about May 1 to investigate costs of production there of oxalic acid, diethyl barbituric acid, barium dioxide, potassium chlorate and sodium nitrite. Dexter North, another chemist, will join the European party later. Investigation into foreign costs of production of logwood extract will be made, in the Caribbean islands principally, at a somewhat later date.

Casein Investigation Under Way

Chief DeLong and Mr. Donk spent several days in New York and vicinity recently conferring with producers of casein regarding the tentative cost schedule. As a result several changes were made in this schedule before it was sent out. There are about seventy producers of casein in the United States. Schedules for the other chemicals, each of which involves a smaller number of domestic producers, were sent out without consultation. While in New York the representatives of the Tariff Commission also arranged with importers for letters of introduction to their foreign connections.

The schedules, in most cases, will be compiled in the office of the Tariff Commission before experts and accountants visit the domestic plants to check the returns and observe conditions, and in others will be filled by the manufacturers and held until the commission's representatives call.

Franklin Discusses Ammonia

Thirty A.C.S. sections throughout the country are to hear Dr. E. C. Franklin, president of the society, lecture on "The Ammonia System of Compounds." His first delivery of the talk was before the Southern California Section on March 16 at Los Angeles.

Dr. Franklin illustrated his remarks by a large number of experiments with liquid ammonia. He stressed the similarity that existed in many of the physical and chemical properties of ammonia and water. Although water was accepted as the universal solvent, ammonia was equally effective. A parallelism existed between the water of crystallization of some compounds and the ammonia of crystallization of others. Pure water is a non-conductor of electricity; liquid ammonia is equally resistive. An experiment was made of attaching to electrodes in the liquid a circuit containing a source of power and an ordinary electric bulb. Insufficient current passed to cause the filament to glow. After the addition of a minute amount of silver nitrate, however, the liquid ammonia became a conductor, and incandescence resulted.

Pure liquid ammonia is neither acid nor base; acids and bases react with it as they do with water. High degrees of concentration are practicable with many salts when dissolved in liquid ammonia; crystallization usually occurs with much greater facility from an ammonia solution than from a water solution. A distinct analogy is traceable between hydrolysis and, to coin a term, ammoniolysis.

Motor Fuel Development Encouraged by France

French importers of gasoline must purchase motor alcohol from the government. Recent legislation in France makes it compulsory for those who import motor gasoline to purchase from the government each month a quantity of motor alcohol equal to one-tenth of the volume of gasoline imported during the previous month. A cablegram to the Department of Commerce from Commercial Attaché C. L. Jones explains that this measure will become effective in July, 1923. The Department of Commerce states that apparently this measure is aimed to utilize the large stocks of alcohol held by the French Government and likewise to assist in the development of a "national motor fuel," using alcohol as a base.

Naval Stores Data Sought

The Bureau of Chemistry is making the necessary preparations to collect annual statistics on turpentine and rosin in the hands of the consuming industries and also statistics showing the stocks of rosin and turpentine at the primary ports and chief marketing centers. Figures will be made public jointly by the Bureau of Chemistry and the Bureau of the Census and will be available some time in May.

Paper Exposition Program Announced in Detail

Large Attendance Expected — Many Exhibitors Have Taken Space— Technical Meetings Planned

Many features both in exhibits and programs mark the opening of the Paper Industries Exposition at Grand Central Palace, New York, on April 9. Ticket demand has been very heavy for the exposition. Only four spaces remain unoccupied; the total number of exhibitors is twice that of the first Chemical Exposition. Every phase of the industry is represented.

The program for the week follows:

Monday, April 9—Opening Day. Formal opening, 2 p.m. Afternoon and evening, motion pictures.

Tuesday, April 10—Clean Food Packaging Day. Afternoon, program of notable addresses; official visit by Salesmen's Association of the Paper Industry; evening, motion pictures.

Wednesday, April 11—Executive Day. Executives of paper-manufacturing plants to be shown through the exposition. Afternoon and evening, motion pictures.

Thursday, April 12—Technical Paper Manufacturing Day. Afternoon, special technical program; official visit by American Paper and Pulp Association and the National Paper Trade Association; evening, motion pictures.

Friday, April 13—Printers, Publishers and Advertisers Day. Afternoon, program of notable addresses; evening, motion pictures.

Saturday, April 14—Consumers Day. Afternoon, special features of interest to paper consumers; afternoon and evening, motion pictures.

CO_2 Consumption Grows

Carbonated beverages now are being consumed in this country at a rate in excess of four billion bottles per year, J. W. Sale, chief of the Water and Beverage Laboratory of the Bureau of Chemistry, estimates. An indication of the growth of the carbonated beverage industry is had in the fact that the membership of the bottlers' organization, the American Bottlers of Carbonated Beverages, although formed only 3 years ago, now has a membership of more than 1,800. The 1923 convention of the organization is to be held in Providence, R. I. The exact date has not yet been set.

To Make Alloy Steel in Canada

The formation of the Dominion Alloy Steel Corporation, Ltd., by a number of iron- and steel-producing experts of wide experience is one of the latest and most interesting developments in the Canadian iron and steel industry. Today all the steel used in the manufacture of motor cars is being purchased from the United States. Canada now ranks as the second largest maker and user of automobiles among the nations of the world. Approximately $600,000,000 is invested in this industry.

Feiker Heads Material Survey

At the request of Secretary Hoover, of the U. S. Department of Commerce, F. M. Feiker, assistant to the president of the McGraw-Hill Co., Inc., has undertaken the organization and general direction of the world surveys of raw material supplies, rubber, sisal hemp and nitrates, for which Congress recently made an emergency appropriation of $500,000.

California Uses Own Resources in Pottery Making

With the exception of English china and ball clays, and English cliftstone whiting, the new plant of the Homer Knowles Pottery Co., Santa Clara, Calif., will utilize almost exclusively Pacific coast raw materials in the production of chinaware. The flint and feldspar will be taken from California properties; the borax and boracic acid will come from Death Valley, Calif.; the oxide of cobalt from California and Nevada; and the oxide of zinc and white lead from other points in this district. Operations at the pottery have been commenced and it is expected to develop the plant to the greatest extent. Homer Knowles is president and L. S. Reading vice-president.

Canada Provides Paper School

Plans are being made by the government of the Province of Quebec, Canada, for the establishment of a pulp and paper-making school and a bureau of scientific research in connection with the forest industries of the province. In this regard the Minister of Lands and Forests is working in conjunction with the Canadian Pulp and Paper Association.

Of importance also to the forest industries is the forthcoming conference between the provinces in the matter of forest protection. This is to extend to all the provinces and it is being hoped also that it will be possible to interest the United States, principally in regard to the Maine forests. The idea that the Minister of Lands and Forests, Honore Mercier, has in mind is that there should be a certain uniformity of laws for the prevention of forest fires.

To Discuss Cement Constitution

The Portland Cement Association, at its forthcoming meeting, is to hear P. H. Bates of the Bureau of Standards discuss the problems of the cement industry. Particular emphasis is to be laid upon the constitution of cement. It is expected that Mr. Bates' talk and the discussion of it will bring out the more important points that will be investigated by the association in the research which has been recently authorized, and which, it is hoped, will be carried out by the association in close co-operation with the National Bureau of Standards.

Commercial and Business News

German Chemical Companies Unable to Fulfill American Contracts

French Occupation Prevents Securing Raw Materials From the Ruhr —Tariff Difficulties Encountered by American Buyers— Poor Containers and Adulterated Products Factors in Demoralizing Trade

THE German chemical market, particularly at Hamburg, has a gloomy outlook which can be attributed to various reasons, among which is the difficulty of obtaining materials from the Ruhr owing to the French occupation.

There are many instances where chemical concerns at Hamburg are unable to fulfill their contracts with American houses owing to the impossibility of getting materials from manufacturers in the Ruhr area. In a number of instances, American firms have found it impossible to obtain delivery on products ready for shipment which are in the hands of manufacturers in the Ruhr and are in a quandary as to what to do in cases of revolving contracts for materials which they have contracted to deliver to American buyers.

Certain American buyers are frantic in their efforts to fill contracts falling due in the United States, and except in cases where the Germans have a speciality chemical which can be obtained from no other country, are rushing to buy the materials in the American market in order not to lose customers and are therefore forced to take losses on some deliveries.

Steady Decrease of American Buyers

American buyers have ceased buying promiscuously in the German market. American buyers in the German market have had unfortunate experiences with the operation of the new American tariff in the payment of duties on some commodities, especially those which were not clearly specified in the new law, the duties on which in certain instances are said to have run so high as to make the value of the commodity three times the wholesale market price in the United States.

Tariff Causes Mixup

In one case a firm which purchased a salt not specifically provided for in the new tariff and which sold for 25c. a pound in the New York wholesale market was requested to pay a duty of 75c. per pound in accordance with the category under which it fell, and finding this impossible, endeavored to cancel contracts for delivery of the commodity with German manufacturers. He was finally forced by court action to take another consignment ready for shipment, resulting in a terrific loss which had its effect in both the German and the American market. A number of other instances of like character might be cited.

High Prices for Containers

Prices for good containers for chemicals have soared to such height that it is almost impossible to obtain a good barrel or jute bag in which to ship materials. Barrels, in some cases, cost more than the materials, and often cheap barrels or used barrels are provided which break before they arrive at their destination or are so dirty inside as to spoil the materials for practical use.

Certain American importers of chemicals state that often when a consignment of salts has reached New York from Germany, after unloading a cargo, there is more salt in the ship's hold and on the dock than in the bags.

Inferior Quality of Chemicals

So many complaints are made as to the quality of German chemicals and so many cases are pending in the German courts between concerns on account of chemicals not coming up to specifications that it has driven the American buyer to other markets. The impurities in epsom salts and glauber salts shipped from Germany are such that they do not come near the U.S.P. specifications, although the German analyst assures the buyer that the product will meet the U.S.P. specifications. This is more noticeable in the dealings with new concerns which have originated since the war than with old established firms, the latter still being careful in all dealings in order to uphold the reputation of their houses. Recently the percentage of sand and iron and other impurities found in certain chemical salts has been very noticeable. One American firm dumped 50 tons of epsom salts into the river after their arrival in this country due to the fact that they contained such a large percentage of such impurities.

High Prices

Prices have in most cases now exceeded gold values and German firms are now importing commodities which they were recently exporting to the United States. Caustic soda, sodium sulphide and sal ammoniac are among the materials which are being purchased from the New York market.

Imports of Chemicals for December Fall Sharply

Chemical Imports for the Calendar Year, However, Show Good Gain Over Those of Previous Years

A decided decrease in the imports of chemicals and allied products is shown by the December figures which just have been compiled by the Department of Commerce. In December the value of chemicals and allied products brought into the country free of duty were valued at $4,738,819. The value of the imports on the dutiable list was $2,809,166. This compares with $10,731,795, the total imports of free and dutiable chemicals and allied products in November. There was a notable falling off also in the imports of coal-tar chemicals. In December the value of all coal-tar chemicals brought into the country was $687,972. In November those imports were valued at $1,055,523.

The imports of paints, pigments and varnishes were valued at $275,514, an increase of $75,000 over the imports in November. It also is noteworthy that the imports of paints, pigments and varnishes in December of 1922 exceeded the value of the imports in December of 1921.

Imports of Fertilizers Decline

Imports of fertilizers in December were only slightly more than half as great as those brought into the country in November. The total value of fertilizers imported during December was $3,851,619. These imports, however, are greater than those of December, 1921, when the value of all fertilizers imported was $569,512. Most of the increase is accounted for by larger imports of nitrate of soda. The increase applied, however, to all the nitrogenous phosphates and to potash fertilizers.

Imports for the Calendar Year 1922

With a compilation of the December figures a review of the imports of the entire calendar year now is possible. Throughout 1922 chemicals and allied products valued at $63,126,239 were imported, about $10,000,000 more than the value of imports during the calendar year of 1921. Imports of coal-tar chemicals throughout 1922 were valued at $11,012,769, slightly less than the value of imports of 1921.

Colors Again Coming In

The year 1922, however, saw the upbuilding of a considerable import of colors, dyes, stains, coal acids and coal bases. The value of these products imported in 1922 was $1,006,924. There were no imports of these commodities during 1921. Paints, pigments and varnishes to the value of $3,673,139 were imported during the 12 months of 1922. This is an increase of a million

and quarter dollars over imports in the calendar year of 1921.

Fertilizers to the value of $45,183,574 were imported during 1922. This is an increase of nearly $15,000,000 over the value of the 1921 imports. The largest single item entering into that total is $26,152,723. The value of Chilean nitrates imported during 1922 was about $9,000,000 more than were imported during 1921.

Comparative figures showing the imports of certain chemicals during December, 1922, with revised chemical figures for December, 1921, are as follows:

	1921	1922
Carbolic acid (lb.)	......	24.510
Other intermediates (lb.)	99,114	111,052
Synthetic indigo (lb.)	336,979	......
Alkalis and alkaloids (lb.)	1,049,861	......
White arsenic (lb.)	......	699,697
Oxalic acid (lb.)	......	488,950
Sulphuric (lb.)	......	432,000
Tartaric (lb.)	......	98,387
Muriate of ammonia (lb.)	451,969	......
Perchlorate (lb.)	......	259,938
Bleaching powder (lb.)	1,998,069	76,800
Crude iodine (lb.)	......	10,734
Cyanide of potash (lb.)	......	236,363
Sodium nitrate (lb.)	......	333,919
Calcium cyanamid (tons)	4,582	6,751
Sulphate of ammonia (tons)	295	......
Muriate of potash (tons)	14,229	8,318
Kainite (tons)	10,777	10,520

Coal-Tar Survey Being Made by Tariff Commission

A thorough survey of production, importation and world conditions of coal-tar dyes and chemicals is being prepared by W. N. Watson, color expert of the chemical section of the Tariff Commission. The work probably will not be completed for several months.

The survey probably will not be published, being intended for the information of Congress, but the data will be made available to the trade on request. This is the first comprehensive survey of coal-tar finished products undertaken by the Tariff Commission, the work heretofore having been confined to an annual census of production and importations, with notes on occasional items for the benefit of committees of Congress. The survey will include chapters on dyes, pharmaceutical ingredients, synthetic tanning materials, flavors and perfumes, phenolic resins and synthetic indigo. It will embrace world production and distribution, domestic conditions and competitive conditions generally.

Washington News

Reduce Rate on Sesame Seed

The Interstate Commerce Commission has upheld the contention of the Globe Cotton Oil Mills that a rate of 55 cents on sesame seed from San Francisco to Los Angeles is unreasonable. The commission finds that the rate was unreasonable to the extent that it exceeded 25 cents per 100 lb. In its opinion the commission held that sesame seed is comparable with flaxseed and rapeseed.

Research Work to Aid in Increasing Arsenic Production

The recent agitation regarding white arsenic and the insecticide of which it is the principal ingredient, calcium arsenate, has served to stimulate research and prospecting for arsenious ores. Beyond these factors, however, there has been no definite result reported, byproduct smelter plants apparently awaiting a more definite demand before going into heavy production of arsenic.

The Geological Survey is engaged in an informal check of estimates of 1923 production of white arsenic, and while there is no report in shape for official announcement, it is said that indications point to a production of 21,000 to 22,000 tons, instead of the approximately 18,000 tons which was estimated in a report given Congress several months ago. Minimum domestic requirements for purposes other than insecticide manufacture are estimated at 9,000 tons.

Research work along the lines of improved methods of recovery of arsenic from smelters and a redistribution of refining plants if demand justifies and also along the lines of less costly and more efficient means of direct recovery of arsenic from ore is progressing actively, being the outstanding result of the recent agitation.

Increased Movement of Nitrate of Soda to This Country

While import figures covering February business are not available, the traffic through the Panama Canal during February indicates a very material increase in the movement of nitrate of soda from Chile to the United States. During February 183,344 tons of that commodity passed through the Canal. While it is known that all of this tonnage did not come to the United States, it does indicate the very much larger volume in which nitrate is moving. It can be said that imports into the United States are greater in proportion than the increases in the shipments to other countries.

Bright Outlook for American Chemical Products

Trade prospects are particularly bright for practically every chemical product that the United States is in a position to export, chemical specialists in Washington point out. The fact that German exports to this country are continuing in larger volume than had been expected should not lead to the conclusion that Germany is exporting in the same volume to other countries or that shipments to America will continue at the present rate. Germany is particularly anxious to secure business where payment is made in dollars. The uncertainty of the situation at home and the way in which the mark is being manipulated at this time are causing Germany, it is believed, to rob her own consumers to fill American orders. To the economic reasons for such procedure must be added the powerful influence to that end which is being exerted by American importers. Some are of the opinion that Germany must almost have given up dyeing at home in her effort to build up dollar credit and hold on to her American market. All reports being received from Germany, however, are to the effect that the volume of new production is low and continues to diminish.

Imports of Coal-Tar Dyes in 1922

Imports of coal-tar dyes in 1922 totaled 3,880,811 lb., valued at $5,600,163, according to premilinary figures from the records of the Commerce Department. Of the total, 1,738,753 lb. valued at $2.533,581, came from Germany; 1,476,715 lb., valued at $2,326,391, from Switzerland; 177,293 lb., valued at $229,608, from England; 145,989 lb., valued at $175,436, from Italy; 168,201 lb., valued at $197,383, from the Netherlands; 57,541 lb., valued at $56,848, from France, and the remainder from Belgium, Canada, Japan and Czechoslovakia.

The total compares with imports of 3,914,036 lb., valued at $5,156,779, in 1921. In 1914, before the domestic dye industry gained a foothold, imports totaled 46,000,000 lb., and only 6,000,000 lb. was produced in the United States, practically all of this from intermediates imported from Germany.

Competition From Moroccan Phosphate Rock

No actual measure is possible as yet of the character of competiton which may be expected from Moroccan phosphate when the railroad is completed between Casa Blanca and Oued-el-Zem. It is known, however, that the Moroccan product is of high grade and will displace Florida phosphate in certain markets. Due to the isolated location of the deposits and the care with which those interested in the development are guarding information as to the probable extent of their output, no accurate data are available. It can be said, however, that the potentialities of this competition are causing concern on the part of those interested in American phosphate properties.

Chemical Company Expands

The Hanovia Chemical & Manufacturing Co., of Newark, N. J., has purchased a large plot of ground adjoining its factory. This purchase was made in order to provide for future expansion of the company.

Heavy Demand Forces Linseed Oil Prices Upward

Record Shipments of Argentine Seed Readily Absorbed—Foreign Oil Bought by Crushers

In the latter part of last year estimates on the Argentine linseed crop indicated an exportable surplus of 62,000,000 bu. Later these estimates were revised and trade opinion now places the exportable at 40,000,000 bu. up to 52,000,000 bu. with many well-informed seed men inclining toward the higher figure. Granting that the lower estimates are correct, there was good reason to believe that the world's supply of linseed was large enough to insure a relatively low price level for linseed oil in all markets. Crop prospects in India were generally favorable and a minimum exportable of 12,000,000 bu. is expected from that country. Moreover, the Continent was regarded to be in a position where its consuming requirements for seed would be less than normal.

Seed Movement Satisfactory

The movement of seed from producing sections has been all that could have been expected. From Oct. 1 to March 31 receipts at Western terminals in this country were about 7,600,000 bu. Imports during the same period swelled the total to such an extent that crushers have had a supply of approximately 17,000,000 bu. This is at the ratio of 34,000,000 bu. for the year—a total which, with the exception of last year, never had been consumed in any year in the history of the domestic industry. Shipments from the Argentine during the first 3 months of this year reached the record volume of 20,744,000 bu. Of this amount 12,926,000 bu. went to the United Kingdom and the Continent, thus showing that the supply in all consuming markets was unusually large.

Reasons for the High Prices

Prices for seed and oil, however, have gone steadily upward and at present these commodities are selling at levels higher than have been in effect since 1920. Various reasons may be assigned for the strong position of the markets. In the first place, it is evident that former standards of consuming needs in this country must be discarded in favor of standards more in accord with the progressive growth of the paint, varnish and other industries whose manufactures include linseed oil as a necessary raw material. In a recent address before the Paint, Oil and Varnish Club of New York one of the most experienced linseed men in the trade stated that this country was consuming seed at the rate of 40,000,000 bu. per year.

Furthermore, Europe has upset all calculations by the extent of its seed purchases and especially by its prominence as a competitor in Argentine markets. As an incidental cause for high prices, it may be recalled that the early promise of a record yield in the Argentine inspired heavy speculative trading on the short side of the market, and the covering of these short sales helped to start the trend of values upward. Briefly summarized, current values for seed and oil may be explained by the natural workings of the law of supply and demand. There appears to be nothing fictitious or inflated about present values, and lower prices can hardly be looked for until the balance swings more in favor of supply.

Interest in Foreign-Made Oil Revived

One of the important developments growing out of the sharp rise in prices is found in the revival of interest in foreign-made oil on the part of American importers. When the new tariff law went into effect last September, it provided for an import duty on linseed oil, of 3.3c. per pound, equal to 24⅘c. per gallon. This was generally regarded as an effective barrier and it was freely predicted that foreign oil would not be able to compete in our markets as long as this tariff remained in operation. Yet last month more than 1,500,000 gal. of oil were reported to have been bought in European markets by American interests, with domestic crushers credited as being the largest purchasers.

Western Railroads Can't Lower Rates on Vegetable Oils

The Interstate Commerce Commission has refused permission to Western transcontinental railroads to reduce freight rates on vegetable oils from Pacific coast points to Chicago and adjacent territory. Transcontinental railroads by schedules filed to become effective Dec. 5, 1922, proposed the 10c. cut. Protest was immediately made by the importers, dealers and manufacturers and the Eastern trunk lines, and the commission suspended the schedules pending an investigation.

Russian Far East Restricts Imports of Chemicals

Advices just received from the Russian Far East state that a law has been passed prohibiting the importation of various commodities. Among the items specified on the prohibited list are many chemicals and allied products, including: glauber salts, phosphates, alcohol, carbonate and bicarbonate of soda, caustic soda, chlorine, lime, resin, tar, asbestos, magnesium, talc, manganese ore, potato flour, fertilizers, varnish, paints, candles, sheet glass, textile raw materials except cotton, inks, except copying and fountain pen ink.

Mills Oppose Move to Lower Vegetable Oil Duties

J. A. Arnold, vice-president of the Southern Tariff Association, has filed a petition signed by 160 cotton oil mills. This petition is in the form of a protest against any move to lower duties on vegetable oils. Edward Woodall, chairman of the Vegetable Oil Division of the Southern Tariff Association, in a memorandum accompanying the petition gives notice that, if the vegetable oil schedule is reopened, he will apply for an increase of 50 per cent in the duties on vegetable oils, based on cost of production in this country compared with similar cost in the Far East.

Trade Notes

Charles J. Roh, vice-president and sales manager of the Murphy Varnish Co., of Newark, N. J., returned last week from an extensive business trip throughout the West, including the Pacific coast.

At the last meeting of the Paint, Oil and Varnish Club of New York, three new members were admitted. They were: H. F. Kleinfeldt, of the Abbe Engineering Co.; R. G. Jackson, of the Kentucky Color & Chemical Co., and W. Buxbaum, of the Winchester Arms Co.

J. C. Smith, for several years secretary of the Oil Seeds Co., of New York City, has formed a new company under the name of the Smith-Weihman Oil Co., with offices at 19 Moore St. Mr. Smith is secretary of the Oil Trades Association of New York.

Charles W. Mixter, of Brookline, Mass., has accepted an appointment as tariff economist on the Tariff Commission.

E. W. Jayne, of Jayne & Sidebottom, left New York last week on a business trip to the Middle West.

The world's production of tin in 1921 was only 109,704 metric tons, the lowest annual output since about 1908 and a decrease of about 16,000 tons from that of 1920.

Dr. J. W. Jenks, of the Alexander Hamilton Institute; W. F. Gephart, of the First National Bank of St. Louis, and A. C. Kains, president of the Federal International Banking Co., New Orleans, will be speakers at the Foreign Trade Convention to be held at New Orleans, May 2, 3 and 4.

Exports of quebracho extract from the Argentine from March 1 to March 23 were 31,000 tons, which compares with 20,000 tons exported in the corresponding period of 1922.

The steamship Stuart Dollar arrived at San Francisco on April 2 from the Far East with 192 packages of arsenic and 352 barrels of china wood oil.

R. B. French, manager of the New York office of the Harshaw, Fuller & Goodwin Co., is on a buisness trip to Buffalo and surrounding territory.

Facts and Figures That Influence Trade in Chemical Products

Market Conditions

Current Prices Imports and Exports The Trend of Business

Steady Contract Deliveries Feature Market for Heavy Chemicals

Antimony Products Advance in Price—Cream of Tartar and Tartaric Acid Firmer—Arsenic Stronger for Spot and Nearby—Tin Oxide Lower—Permanganate of Potash in Light Supply

GOOD call is reported for contract deliveries of most heavy chemicals and in some cases producers are using their entire output to take care of existing orders. New business during the week showed a falling off as compared with the preceding week. German chemicals have attracted attention following reports that difficulty was found in securing supplies. In many cases stocks already contracted for are not coming to hand and importers who had resold their German contracts have been trying to protect their buyers by securing the goods from sources outside the original sellers. The freight situation is still unfavorable for moving materials from some sections of this country and this is causing some delays in deliveries.

Permanganate of potash was actively sought during the period but offerings are small as domestic goods are sold ahead and imported material is not coming in freely enough to relieve the spot stringency. Large amounts of arsenic reached the local market during the week but most of this went direct to consumers and the balance was sold while afloat so the spot situation was not bettered. Cream of tartar and tartaric acid are feeling an increased seasonable demand and brought higher prices in the local market. Antimony oxide and other antimony products likewise were firmer. Tin oxide lost the advance reported at the beginning of the month and showed a decline of 3c. per pound. Hydroquinone was offered at $1 per pound, which represents a decline of 5c. per pound. Hyposulphite of soda also was offered at prices more in buyers' favor. Formaldehyde was unchanged in price as far as producers were concerned, but second hands were shading.

Fertilizer Chemicals Active

The fertilizer trade has had a very active season and a correspondingly active call for many chemicals has come from that source. While the season is now well advanced, there still is heard a good inquiry for many fertilizer chemicals. It is significant to note that imports of fertilizer materials for the last calendar year reached a valuation of $45,183,574, which represents a gain of nearly $15,000,000 over the total for 1921. Of this increase about $9,000,000 was credited to nitrate of soda. Imports of all chemicals for the year ending December 31 were valued at $63,126,239, or about $10,000,000 more than in the preceding year.

Acids

Acetic acid—Consumption of acetic acid continues in a satisfactory way and there appears to be no likelihood of an easing off in prices for some time to come. The corroders have been absorbing large quantities. The 28 per cent held at $3.17½ per 100 lb., while the 56 per cent was nominally unchanged at $6.35@$6.37 per 100-lb. Glacial closed at $12.05@$12.85 per 100-lb.

Citric acid—There was a seasonable increase in the volume of business and with foreign markets tending higher prices here were quite firm at the close. The imported was raised to 51c. per pound in more than one direction and talk of even higher prices than this was heard in the local trade. Domestic material held at 49@50c. per pound. Several shipments came through from abroad in the past week.

Formic acid—The 85 per cent was available at prices ranging from 14½ @17c. per pound, according to quantity, delivery, etc. The market was a little unsettled in some directions.

Boric acid—The market was steady on the basis of 11c.@11½c. per pound. Some traders were not disposed to shade 11½c. per pound, immediate delivery.

Muriatic acid—Production is well taken care of and a firm undertone features the market. Nominal quotations range from $1.00@$1.10 per 100 lb., on the 20 degree in tanks.

Oxalic acid—There was a firm undertone to the market for oxalic acid and makers recently advanced prices to the basis of 12¾c. per pound, f.o.b. works. Spot material settled at 13¼c.@13½c. per pound. The fact that competition with foreign goods, temporarily, has been eliminated, brought out a much better feeling here. Imported costs from 13¼c.@13½c. to import, according to advices received here late in the week.

Sulphuric acid — Consumption has been good for some time past and with stocks reduced in nearly all directions a strong undertone features the market. The 66 degree variety closed at $15@$16 per ton, in tanks, f.o.b. works. On the 60 degree the nominal quotations range from $9.50@$10.50 per ton, f.o.b. works. Oleum was raised to $18.50@$19.50 per ton.

Tartaric acid—Producing costs have advanced and this combined with good consuming demand has strengthened the market. Sellers now hold imported at 34c. per lb. and domestic makes are held at an inside price of 35c. per lb.

Potashes

Bichromate of potash—Some reports credited sales of moderate sized lots at 10¾c. per lb. but the general asking price showed 11c. per lb. as the inside price. Stocks have been moving freely and the market appears to be in a strong position with much depending on future developments in the market for muriate.

Carbonate of potash—Buyers have shown considerable interest in hydrated but offerings are so meager that trading has been held down to small volume. Prices are little better than nominal at 7½c. to 7¾c. per lb. Shipments are quoted at the same level as spot but guaranteed deliveries are hard to locate. Calcined 80-85 per cent likewise were practically taken off the market and in most quarters prices meant nothing in the absence of offerings. Calcined 96-98 per cent sold in a small way with asking prices at 8c. per lb. and upwards according to seller.

Caustic potash—Inquiry for spot and prompt shipment was not heavy but offerings are light and prospects are more favorable for an advance rather than a decline in price. Sales of 88-92 per cent on spot were reported at 8¼c. per lb. and as high as 8½c. per lb. was asked by some holders. Shipments are firm at 8¼c. per lb.

Permanganate of potash — Domestic producers are busy taking care of orders

"Chem. & Met." Weighted Index of Chemical Prices

Base = 100 for 1913-14

This week	181.61
Last week	181.44
April, 1918 (high)	286.00
April, 1919	231.00
April, 1920	261.00
April, 1921 (low)	140.00
April, 1922	158.00

The moderate advance in the index number was caused chiefly by the uplift in linseed oil. Chemicals showed but little average change.

in hand and have little if any surplus for new business for April delivery. Imported goods have sold freely and it is difficult to locate round lots for prompt delivery. Spot prices are given at 25½c. per lb. and upwards, according to seller. Goods afloat are said to have sold at 25c. per lb. April shipments were offered at 22c. to 22½c. per lb.

Sodas

Bichromate of soda—Small lot transactions have predominated throughout the week, although round lots have passed against contracts. Producers are maintaining values at 7½c. per lb. at the works and spot trading is going through at prices ranging from 7¾c. to 8c. per lb. depending on quantity and seller. Chrome ore is quoted at $20.50 per ton for Indian, c.i.f. Atlantic ports. Rhodesian and New Caledonian are held at $21 to $24 per ton.

Caustic soda—Reports on export business vary but it seems certain that considerable business has been transacted for shipment abroad at prices ranging from 3.45c. to 3.50c. per lb. f.a.s. Domestic buyers have been taking on stocks in a large way and a firm tone is evident in the market. Producers offer at $2.50 per 100 lb. at the works, basis 60 per cent, with the usual premiums for less carlot quantities. Second hands offer solid 76 per cent at $3.45 to $3.65 per 100 lb. in the spot market, the range varying according to quantity and make.

Chlorate of soda—Some offerings of inferior grades have been on the local market and have been quoted under the open market price. Domestic producers report a good call for their product both in the way of new business and in ordering material out on old contracts. Prices are firm and unchanged at 6½c. to 7c. per lb. at the works. Imported grades are not pressing on the market and are held at 6½c to 7c. per lb.

Hyposulphite of soda—There was a general reduction in the market, establishing the price at $2.50@$2.75 per 100 lb. Demand has been rather inactive and with offerings of foreign material very much in evidence the situation has favored buyers for some weeks past.

Nitrate of soda—Activity in the fertilizer trade has been noted for some time and large amounts of nitrate of soda have been delivered at Southern ports. Buying orders are still prominent and it is evident that many consumers are not covered up to their full requirements. It is probable that demand will not continue active much longer, as the fertilizer season is too far advanced to permit of trading in the volume recently noted. Revisions in the prices of producers in Chile have been expected but so far no announcement has reached the domestic trade. Importers say the amount held in this country is small and this has a sustaining effect on values. Nitrate is quoted at $2.65 per 100 pounds ex vessel, Atlantic ports.

Nitrate of soda—The market has picked up a little in activity but the improvement has not been sufficient to describe trading as active. Some consuming trades are in the market constantly while others are hardly taking their normal requirements. Sellers are offering freely but are not cutting prices in order to stimulate buying. Foreign grades are offered in numerous directions and prices vary from 8½c. to 9c. per lb. according to quantity and seller. Domestic grades also are in good supply with prices holding on an unchanged basis of 10c. to 10½c. per lb.

Silicate of soda—Different consuming trades have been in the market and sellers report a very satisfactory volume of business. Considerable quantities of silicate are said to be used in the sealing of paper cartons. Producers quote the 40 degree at 75c. to 85c. per 100 pounds at the works. The 60 degree is held at $1.60 to $1.70 per 100 pounds works.

Soda ash—New business continues to hold up well but the bulk of the business passing is against old contracts. Consumers are calling for deliveries promptly and more than normal amounts are being taken off the market. With the large production well taken care of and producing costs holding at relatively high levels the market is working into a very strong position although no price changes seem in immediate contemplation. Some producers are not eager to enter into new contracts calling for extended deliveries. Contract prices for light ash, basis 48 per cent, are quoted at $1.20 in bags and $1.40 in barrels. Dense ash is quoted at $1.25 in bags and $1.45 in barrels. Dealers were offering carlots of light ash at $1.75 in bags and $1.95 in barrels.

Miscellaneous

Antimony oxide—White oxide guaranteed 99 per cent has been firm with higher prices in effect due to higher cables from China and limited offerings on spot. Demand has been quiet, but this had no influence as a market factor. Quotations are now held at an inside figure of 9c. per lb. Standard powdered needle antimony is held at 8c. per lb., with lump nominal at 7¾c. per lb.

Arsenic — Fairly large amounts of white arsenic reached the market in the past week coming from Japan. Nearly all arrivals, however, were sold ahead and there still is a scarcity of spot material. Quotations in the spot market vary from 15½c. to 16c. per lb., according to seller. Sales of March-April from Japan were reported at 14½c. per lb. June shipment from Japan was quoted at 12½c. per lb. and some reports were heard to the effect that contracts covering shipments over the last half of the year could be placed at 11c. per lb. Sales of material afloat were put through at 15½c. per lb.

Bleaching powder—Steady withdrawals are being made against contracts with active interest in spot and nearby goods. Some producers are sold up to capacity and there are no heavy surplus stocks in any quarter. A firm undertone features prices and large drums are held at $2.40@$2.55 per 100 lb. at the works. Spot cars at the works are quoted at $2.20 per 100 lb. The contract price remains at $1.90@$2.00 per 100 lb.

Borax—The market has maintained a steady position with a seasonable movement to consumers. Granulated and refined, crystals or powdered are offered at 5¼c. per lb. in bags, carlots. The price for goods in barrels was 5½c. per lb. Boric acid was quiet but steady at 11c. per lb.

Copper sulphate—Demand has been fairly active and a firmer feeling was in evidence. Cables again reported a higher market abroad and it was doubtful whether $5.70 could have been shaded on May-June shipment from the other side. Domestic makers quote the market at $6.25@$6.50 per 100-lb. on the large crystals, the inside figure obtaining on round lots only.

Cream of tartar — Consumers have been in in the market in an active way and with producing costs increasing the tendency of prices has been upward. The inside price is now given as 25½c. per lb. and asking prices range up to 26½c. per lb.

Formaldehyde — An easy tone has featured trading in this chemical. In the first place buyers are reserved and are interested only when price concessions are granted. First hands are keeping their quotations nominally unchanged at 16c. per lb. but resale offerings have changed hands as low as 14½c. per lb.

Lead acetate—With no important change in pig lead and the demand for the chemical fairly active prices ruled firm so far as the leading producers were concerned. White crystals, in casks, held at 13½c. per pound. White powdered was offered at 14¼c. per pound, in casks, and 15¼c. per pound, in kegs. The brown, broken, in barrels, settled at 12½c. per pound.

Lead arsenate—With the demand holding up well on the approach of the season of large consumption prices ruled steady, but closed the week unchanged at 12@12½c. per pound for the paste and 21½@22c. per pound for the powdered.

Nickel sulphate—Leading sellers were asking 11½c. per lb. as the inside price. Nickel ammonium sulphate was firm at 10½c. per lb. and upwards, according to quantity.

Sal ammoniac — Several shipments from abroad were landed here last week, but this failed to shake the market. The undertone was firm in all directions, reflecting higher replacement cost. Imported white on spot settled at 7@7½c. per pound. Imported gray was raised to 8½@9c. per pound. Domestic white granular held at 7¾@8c. per pound, carlots, f.o.b. works. Lump was firm at 14½@15½c. per pound, immediate delivery.

Salt Cake—Resale lots are very difficult to locate and only occasional sales of small lots are reported. First hands also have very little to offer, as they are using their output to fill contracts. Consumers are interested in taking on fresh commitments but under the circumstances trading is naturally restricted. Quotations hold at $25 to $27 per ton for bulk lots.

Sulphate of Aluminum—Quiet conditions have prevailed, as most consumers are covered ahead. Contract withdrawals are of good volume and prevent any accumulations in the hands of producers or sellers. Prices have held steady and unchanged at $2.50 to $2.75 per 100 pounds for iron free and $1.50 to $1.60 for the commercial.

Tin oxide—There was a reduction of 3c. per pound in tin oxide, following closely upon the easier situation in the metal. Leading makers now offer tin oxide at 52c. per pound, in barrels, immediate delivery. Trading was moderate throughout the week.

Coal-Tar Products

Active Demand for Phenol—Production Inadequate—Benzol Offerings Increase—Crude Naphthalene Higher Abroad—Solvents Scarce

INTEREST centered in the strong situation which has arisen in the market for phenol. The inquiry was fairly active, but business in spot and nearby material was restricted for want of offerings. Talk in the trade of new sources of domestic production did not change the attitude of sellers. Large handlers of phenol have no faith in the prospects for increasing the output so far as the immediate future is concerned and when old contracts expire there is a strong possibility that new prices will show a higher range. Demand for benzol has not yet opened up and this accounts for the slightly easier undertone for this commodity. Solvent naphtha was scarce, owing to the sold-up position of the market. Crude naphthalene was higher abroad and this stiffened prices here. Several parcels of cresylic acid arrived from the other side, despite the high duty, but there is much dissatisfaction over the tariff and traders believe that something will have to be done so that consumers not protected with contracts for the domestic material may continue manufacturing without resorting to a change in formulas. Owing to the inability of German makers to make shipments without encountering all sorts of difficulties because of the Ruhr situation, American manufacturers have been in a position to compete for foreign business. Reports of some large orders in dyes for shipment to China were current in trade circles. The Department of Commerce has announced March imports of coal-tar dyes as 312,809 lb., valued at $301,436, of which 66 per cent came from Germany, 18 per cent from Switzerland and 12 per cent from Italy, the latter representing reparation dyes which were re-exported. March imports compare with 191,709 lb., valued at $199,640, for February, and approximately the same amount for January.

Coal-Tar Crudes, Etc.

Benzene—Offerings were freer and the market presented an unsettled appearance. Traders expect that business will soon open up, as a spell of good weather would bring about increased consumption in the motor fuel field. The 90 per cent was nominally unchanged at 27c. per gallon, in drums, carload lots, contract basis.

Cresylic Acid—Domestic producers have nothing to offer, production being sold up on the basis of 70c. per gallon. In the outside market scattered lots of imported, on spot, sold at $1.40 for the 97 per cent, in drums, and $1.30 for the 95 per cent, in drums. Owing to the tariff situation importers were disposed to offer this material for shipment "in bond" and late in the week the general quotation on nearby material was 85c.

Phenol—Demand was fairly active, but spot business was restricted because of the sold-up condition of the market. Second-hands reported sales in U.S.P. phenol, immediate delivery, in lots of 1 to 3 tons at prices ranging from 52c. to 53c. per pound. Foreign material for shipment was available around 50c. A report was current in the trade that a new factor would soon be in a position to offer phenol. The high prices, in the opinion of traders, will stimulate production. The surplus stocks purchased from the government are disappearing at a surprising rate.

Naphthalene—Importations of crude were reported, but this made no impression upon the market. Cables reported a firmer situation in crude and this resulted in steadying prices in the New York trade. Crude, a little off in quality, brought 2¾c. per pound. On standard material asking prices now range from 3¼c. to 3¾c., as to quantity and seller. Demand for balls was good and the prices were raised to 10½@11c. per pound. Flake held at 9½c., immediate delivery, and 9c. for June-July. On distant futures prices were considered too vague to quote.

Solvent Naphtha—Production appears to be well sold up and rumors of some re-selling were without foundation. The water-white, in drums, was merely nominal at 37@40c. per gallon. Demand was fairly active.

Toluene—Trading was slow and the market was a featureless affair. Production is limited because of the quiet state of the market. Nominal quotations range from 30@35c. per gallon, contract basis.

H Acid—Offerings were scanty on spot and prices of 80@85c. were considered wholly nominal. Producers say that they have enough orders on hand to take care of their output for some little time to come.

Alpha-naphthylamine—Small parcels sold at 38c. per pound, immediate delivery. The supplies available were moderate only and it was doubtful whether 35c. could have been shaded on a round lot for nearby delivery.

Aniline Oil—The market was inactive, but offerings were not pressing for sale and leading handlers continued to quote from 16c. to 16½c. per pound, as to quantity.

Beta-naphthol—There were offerings at 22c. per pound, round-lot basis, with smaller quantities changing hands at 25c. per pound. The market was barely steady in some directions.

Dimethylaniline — A firmer feeling was reported in this intermediate reflecting improvement in the demand. At the close traders were asking 42@43c. per pound.

Para-cresol—A cable from England quoted para-cresol for immediate shipment at 35d. per pound, c.i.f. New York terms.

Para-toluidine—With offerings scanty the market ruled firm at the recent advance, prices holding at 95@97c. per pound. The inquiry was fair.

Pyridine—The market was entirely nominal, traders experiencing difficulty in obtaining supplies. Recent business in small lots went through at $2.40 per gallon.

N. & W. Acid—Inquiry was moderate only; but with no accumulation in supplies prices for Neville and Winthers acid held at $1.25 per pound.

Xylene—The commercial variety was offered in a moderate way at 30@32c. per gallon. The pure was nominal at 45@50c. in drums.

Propose Uniform Contract for Chemical Trade

The Salesmen's Association of the American Chemical Industry has taken up the question of formulating a uniform contract to be used by the trade in transactions involving heavy chemicals.

The following committee has been appointed to draw up the contract:

Chairman—John A. Kienle, vice-president, in charge of sales, Mathieson Alkali Works, Inc.; P. S. Tilden, sales manager acid and heavy chemical division, E. I. du Pont de Nemours & Co.; E. J. Barber, manager chemical department, White Tar Co., Inc.; Ralph F. Durland, manager, N. Y. sales office, Dow Chemical Co.; William Haynes.

Vegetable Oils and Fats

Linseed at New High for Season—Cottonseed Steadies in South—Coconut Quiet—Good Call for Soya

Linseed oil—The feature in the vegetable oil trade last week was the sharp uplift in prices for linseed oil. Crushers had warned the consumers repeatedly of the impending crisis in the matter of spring deliveries, but it is safe to say that few gaged the market correctly and the fact that several producers would consider less than carlot business only, covering April-May deliveries, proved conclusively that their tanks must be very nearly dry. Spot oil closed at $1.14 per gallon, carlot basis, which compares with $1.10 a week ago. One lot of 1,000 barrels of June oil sold early in the week at $1.06, but the price for this position at the close was $1.10 asked. July oil settled at $1.09, with August forward at $1.07 @$1.08 per gallon, carlots, cooperage included. The flaxseed markets established new highs for the season on light offerings of nearby material. There was no important change in the world's flaxseed situation. Crushers in New York territory apparently have enough seed on hand, but are handicapped by insufficient press capacity. Production could not be augmented in time to help the market. Foreign oil was active and well-informed members of the trade say that more than 1,500,000 gallons have been purchased for shipment to this country in the past month or so. At the close bids of $1.14 per gallon, duty paid, were turned down for oil afloat. April shipment from the other side settled at $1.10, with May-June at $1.07@$1.08, c.i.f. terms. Linseed cake was offered at $35 per ton, in bags, summer positions. Demand for cake for export was dull. A parcel of 3,000 tons of Argentine flaxseed afloat sold at $2.31, c.i.f. New York.

Cottonseed oil—The recovery in lard in the West, together with favorable news on the distribution of cottonseed oil and products, brought out a recovery in prices for the options. Estimates on March consumption were optimistic and trade leaders expect that the disappearance will exceed 200,000 barrels. April business has opened up well and should the rate of consumption be maintained the supply situation may become tight before new oil is available. Crude settled nominally at 10½c., f.o.b. mills.

Coconut oil—Business fell away and prices at the close were barely steady, both here and on the coast. Ceylon type oil was offered freely at 9c. coast, sellers' tanks, with intimation that this figure could be shaded on a firm bid. The market here settled at 9½@9⅝c. per pound, tank car basis. Copra ruled firm around 5½c. per pound, c.i.f. Pacific coast ports.

China wood oil—The offerings were meager, despite the fact that several parcels reached United States ports. Spot oil held at 35c. a pound in the "outside" market. On futures, traders were reluctant to quote pending a freer movement of oil from the interior of China. A nominal price for July-August shipment oil was 24½c.

Palm oil—Nearby oil was firm on moderate offerings, but some traders regarded the more forward positions as a little unsettled. Not much new business was placed last week. Lagas for shipment held at 8.55c. per pound, with Niger at 8.20@8.25c. per pound, c.i.f. New York.

Sesame oil—Refined imported oil sold at 12¼c., c.i.f. New York, nearby positions. May shipment was traded in at 12c., c.i.f. terms.

Soya bean oil — Bids at 10¼c. per pound for seller's tanks, April shipment from the coast were turned down. The asking price at the close on nearby material was 10½c., duty paid, f.o.b. coast. Demand was fairly active.

Menhaden oil—Trading in new oil on the "if made" basis has set in and it is estimated that more than 10,000 barrels of crude sold at 50c. per gallon, f.o.b. point of production.

Tallow—Sales during the week reached the total of 1,000,000 pounds, the bulk of the business passing being in extra special on the basis of 9c. per pound, loose, ex-plant.

Greases—Offerings were limited and prices ruled firm. Low acid yellow held at 8½@8¾c. per pound.

Miscellaneous Materials

Barytes — Demand for the white floated was fairly active and with no change in the position of crude prices ruled firm on the carlot basis of $28 per ton, containers included, f.o.b. St. Louis. Crude held at $8@$10 per ton, f.o.b. point of production. Off color, wet ground, was offered at $15@$16 per ton, f.o.b. works.

China clay—There was a steady call for this material and prices were firmly maintained. Crude was nominally unchanged at $7@$9; powdered, $13@$20, f.o.b. Virginia points. Imported lump $15@$20 f.o.b. American ports; powdered, $45@$50.

Pyrites—Imported lump, 1 in. diameter and up, 12c. per unit; fine, 12c. per unit, ex ship, Atlantic ports. Market steady.

Lithopone — Several shipments arrived at New York from Antwerp. Domestic makers reported a good volume of new business on the basis of 7c. per pound, in bags, carlots, April-May-June delivery. The market was firm.

White lead—The market for the metal was a shade easier, but this did not influence corroders and prices for the pigments were unchanged. The official quotation for pig lead held at 8.25c., New York. Trading in the pigments was fairly active. With stocks of unsold material subnormal and as there appears to be little likelihood for a sudden change in the metal situation, producers hold out no encouragement in the way of lower prices. Standard dry white lead, basic carbonate, closed the week at 9¾c. per pound, in casks, carlots. Red lead, dry, was offered at 11.40c. per pound, in casks.

Zinc oxide—A firm undertone featured the market. Producers report steady gains in the volume of business, and, with the metal showing no important change, they regard the market as favoring sellers so far as the future is concerned. American process, lead free, held at 8c. per pound, carlot basis, with the leaded grades commanding from 7@7¼c. per pound. French process, red seal, was available at 9¾c. per pound.

Glycerine—Several refiners announced a reduction of ½c. per pound in the chemically pure grade, establishing the market at 18c. per pound, in drums. The reason for the decline could be traced to the unsettled market for crude. Business was inactive during the past week and competition was more of a factor. Dynamite sold at 16½c. per pound, carlot basis. The arrival of several shipments of foreign crude was noted. Soap lye crude, basis 80 per cent, loose, carlots, closed nominally at 11@11¼c. per pound. Recent business in the Middle West went through at 10¾c. Saponification was offered sparingly and quotations of 12¾@13c. were considered nominal.

Naval stores—The shrinkage in spot holdings brought out a general advance in prices. Turpentine sold as high as $1.53 per gallon in the Savannah market. In the New York trade the nominal quotation toward the close was $1.61 per gallon. In rosins prices ruled firm on the basis of $6.20 per barrel for the "B" grade. Demand for rosins was good. Pine tar pitch held nominally at $6.00 per barrel.

Shellac — Cables from Calcutta reported a steady market toward the close, with the result that operators here were no longer anxious to discount futures. The importations were not large enough to bring out any real change for the better in the market for spot goods. The inquiry was satisfactory. T. N. on spot settled at 76c. per pound. Bleached, bone dry, held at 90c. on spot, with futures available around 86c. Superfine was traded in at 80@81c. per pound. Calcutta offered T. N., April shipment, at 72c. c.i.f. New York.

Alcohol—A fair trade was reported in denatured alcohol and prices ruled steady. The No. 1, 188 proof, was offered at 39c. a gallon, with the No. 5 at 38c. a gallon. Methanol, 95 per cent, was maintained at $1.19@$1.21 a gallon; 97 per cent close at $1.21@$1.23 a gallon. The situation in ethyl was unchanged, quotations holding on the basis of $4.75@$4.85 for the 190 proof.

Imports at the Port of New York

ACIDS—200 kegs tartaric, Bremen, Order; 100 cs. tannic, Shanghai, East Asiatic Co.; 100 csk. citric, Rotterdam, Order; 456 bbl. citric, Palermo, Order; 4 bbl. tartaric, Palermo, Order; 157 bbl. stearic, Rotterdam, M. W. Parsons; 41 drums phosphorus, Hamburg, Hummel & Robinson; 78 dr. cresylic, Hamburg, Caldwell & Co.; 60 pkg. phosphoric, Bremen, Order; 10 csk. oxalic, Antwerp, Brown Bros. & Co.

ALBUMEN—54 pkg., Hamburg, Cooper & Cooper.

ALCOHOL—25 bbl. den't'd, San Juan, M. Fiegel Bros.; 115 bbl. do., San Juan, C. Esteva.

ALIZARINE—6 csk., Hamburg, Kuttroff, Pickhardt & Co.; 4 csk., H. A. Metz & Co.

AMMONIUM—60 csk. muriate, Glasgow, Nat'l. City Bank; 100 cs. bromide, Hamburg, Nat'l Am. Bank; 549 csk. nitrate, Hamburg, Kuthroff, Pickhardt & Co.; 70 csk. muriate, Bristol, C. de P. Field & Co.; 40 pkg. carbonate, Liverpool, Brown Bros.; 112 csk. phosphate, Antwerp, Globe Shipping Co.

ANTIMONY SALT—20 bbl., Hamburg, J. D. Lewis.

ANTIMONY OXIDE—335 bags, Hankow, Java Handelsvereeniging.

ARSENIC—100 bbl. red, Hamburg, Brown Bros. & Co.; 200 csk., Hamburg, Pfaltz & Bauer; 338 bbl., Antwerp, Order; 109 csk., Rotterdam, Lunhan & Moore; 496 cs., Kobe, China Am. Tobacco Trading Co.; 150 cs., Kobe, N. Y. Trust Co.; 579 cs., Kobe, Takata & Co.; 360 cs., Kobe, Nat'l Shawmut Bank of Boston; 200 cs., Frazar & Co.; 100 cs., Kobe, Order; 120 cs., Yokohama, Am. Trading Co.

BARYTES—500 bags, Bremen, Order.

BARIUM NITRATE—29 csk., Hamburg, Industrial Trust Co.

BARIUM CARBONATE — 130 bags, Bremen, Hummel & Robinson.

BLANC FIXE—48 bbl., Hamburg, A. Murphy Co.

BARIUM BINOXIDE—64 cyl., Havre, Mallinckrodt Chem. Works.

BARIUM CHLORIDE—71 csk., Hamburg, A. Klipstein & Co.; 52 csk., Antwerp, Order.

CALCIUM CHLORIDE—166 dr., Hamburg, Order.

CASEIN—85 sk., Rotterdam, T. M. Duche & Sons; 128 bags, Hamburg, A. Klipstein & Co.; 751 bags, Buenos Aires, Bank of America; 998 bags, Buenos Aires, Brown Bros & Co.; 2,083 bags, Buenos Aires, Order.

CHEMICALS—3 cs., London, Order; 42 cs., Antwerp, J. E. Dockendorff & Co.; 31 bbl., Hamburg, Arco Trading Corp.; 45 csk., Jungmann & Co.; 35 dr., Hamburg, F. Boehm, Ltd.; 135 dr., Hamburg, Hummel & Robinson; 400 pg., Bremen, A. Klipstein & Co.; 92 pkg., Hamburg, Superfos Co.; 10 cs., Hamburg, Order; 200 csk., Antwerp, Guaranty Trust Co.; 400 bags, Antwerp, C. B. Richard & Co.; 500 csk., Antwerp, Order; 422 pkg., Liverpool, Monsanto Chem. Works; 50 cs., Bremen, Merck & Co.

CHALK—75 csk. precipitated, Bristol, H. J. Baker & Bro.; 1,000 bags ground, Antwerp, Cooper & Cooper; 400 bags, Antwerp, Irving Nat'l Bank; 2,215 bags, Antwerp, Order; 200 bags, Antwerp, Order; 500,000 kilos, Dunkirk, J. W. Higman & Co.; 990,000 kilos, Dunkirk, Taintor Trading Co.; 1,000 bags, Antwerp, Bankers Trust Co.

COPPER SULPHATE—77 csk., Liverpool, E. M. Sergeant & Co.; 200 csk., Liverpool, Order; 98 csk., Swansea, Order; 201 csk., Antwerp, Order; 400 csk., Liverpool, Order.

COLORS—5 bbl. aniline, Hamburg, Carbic Color & Chem. Co.; 2 csk. aniline, Hamburg, Kuttroff, Pickhardt & Co.; 13 csk. aniline, Genoa, Irving Nat'l Bank; 6 csk. aniline, Genoa, Ladenburg Thalmann & Co.; 8 csk. aniline, Genoa, Am. Exchange Nat'l Bank; 29 bbl. black, Kobe, American Trading Co.; 20 cs. dry, London, Downing & Co.; 9 kegs aniline, Liverpool, Textile Alliance.

COPRA—13,514 sk., Cebu, Order; 119 bags, Morant Bay, Franklin Baker Co.

DEXTRINE — 500 bags, Rotterdam, Stein, Hall & Co.; 500 bags, Rotterdam, J. Morningstar Co.

DIVI-DIVI — 1,481 bags, Maracaibo, Huth Gillespie & Co.; 334 bags, Puerto Plata, Cordilleras Comm. Co.

EPSOM SALT—750 cs., Hamburg, Brown Bros. & Co.; 6,000 bags, Hamburg, Superfos Co.; 160 csk., Hamburg, Order.

FLORIUM NITRATE — 3 cs., Hamburg, Order.

FULLERS EARTH—250 bags, London, C. B. Crystal Co.; 350 bags, Bristol, L. A. Salmon & Bro.

FLUORSPAR—300 bags, Rotterdam, L. A. Salmon & Bro.

GUMS—125 bags Persian, Bombay, Guaranty Trust Co.; 469 bags karaya, Bombay, Brown Bros. & Co.; 266 bags do., Bombay, Chatham & Phenix Nat'l Bank; 90 bags do., Bombay, Irving Nat'l Bank; 1,426 bags do., Bombay, Order; 106 pkg. tragacanth, Bombay, Order; 375 cs. gum, Calcutta, Balfour, Williamson & Co.; 150 cs. tragacanth, London, Thurston & Braidich; 205 pkg. damar, Singapore, Order; 525 pkg. arabic, Port Sudan, Thurston & Braidich; 2,758 pkg. arabic, Port Sudan, Order; 260 bags arabic, Port Sudan, Nat'l Bank of Egypt; 420 bags arabic, Port Sudan, Thurston & Braidich; 350 bags arabic, Port Sudan, Caracando Bros.; 2,030 pkg. arabic, Port Sudan, Order; 400 bags copal, Antwerp, Brown Bros. & Co.; 25 bags, copal, Antwerp, Order; 294 pkg. copal, Antwerp, Order; 15 bbl. sandrac, Marseilles, G. Lincks; 24 bags copal, London, S. Winterbourne & Co.; 50 pkg. damar, Batavia, Balfour, Williamson & Co.; 200 cs. damar, Padang, Smith & Schipper; 100 cs. damar, Padang, Order; 8 cs. damar, Tandjong Priok, Order; 2,293 pkg. copal, Macassar, Order; 75 cs. damar, Port Said, Order.

GALLNUTS—250 cs., Hankow, Arnhold Bros.

GLAUBERS SALT—500 bbl., Hamburg, E. M. Sergeant & Co.; 35 bbl., Hamburg, Schutz & Rulckgarber; 122 bbl., Hamburg, Order.

GLYCERINE—40 dr., Antwerp, N. Y. Trust Co.; 54 dr., Melbourne, Marx & Rowolle.

HEXAMETHYLENETETRAMINE — 38 cs., Hamburg, Industrial Trust Co.

HYDROGEN PEROXIDE—64 pkg. Antwerp, Order.

IRON SULPHATE—57 csk., Antwerp, E. M. Sergeant & Co.; 311 bbl., Antwerp, Order.

LOGWOOD EXTRACT—131 bbl., Cape Haitien, Logwood Mfg. Corp.; 15 bbl. crystals, Cape Haitien, Logwood Mfg. Corp.

LITHOPONE—120 csk., Bremen, Pfaltz & Bauer; 1,500 csk., Antwerp, Benj. Moore & Co.; 200 csk., Antwerp, A. Klipstein & Co.

MYROBOLANS — 4,312 bags, Bombay, Order; 4,410 bags, Calcutta, Nat'l City Bank; 6,880 pkts., Calcutta, Order.

MANGANESE—22 csk., Bristol, Lamson A. & C. Co. Magnesia, chloride, 70 dr., Brown Bros. & Co.; 138 dr., Hamburg, Brown Bros. & Co.; Magnesite, calcined, 295 bbl., Rotterdam, Innis Speiden & Co.

NAPHTHALENE — 886 bags, London, Irving Nat'l Bank; 1,740 bags, Hamburg, Holder of B. L.; 150 bags, Hamburg, L. Martin Co.; 500 bags, Hamburg, Order; 270 bags, London, Irving Nat'l Bank.

NICKEL SULPHATE—47 csk., Swansea, Order.

OILS—Cod—225 csk., St. Johns, R. Badcock & Co.; 60 bbl., St. Johns, Bowring & Co.; 200 csk., St. Johns, Job Bros. & Co.; 160 bbl., London, Order. **Coconut**—710 tons, Manila, Order; 816 tons, Manila, Order. **China wood**—306 csk., Hankow, Cook & Swan; 1,000 bbl., Hankow, Order. **Fusel**—29 dr., Rotterdam, Credito Italo.; 33 dr., Hamburg, Order; 31 bbl., Hamburg, Order; 24 dr., Antwerp, Guaranty Trust Co.; 50 dr., Rotterdam, Caldwell & Co.; 6 dr., Rotetrdam, Order; 12 bbl., Dunkirk, Guaranty Trust Co. **Olive, sulphur**—350 bbl., Milazzo, Banca Comm. Italiana; 300 bbl., Milazzo, Order; 200 bbl., Palermo, Brown Bros. & Co.; 200 bbl., Palermo, Order. **Palm**—64 csk., Liverpool, African & Eastern Trading Co.; 8 csk., Liverpool, Order; 250 csk., Hamburg, African & Eastern Trading Co.; 174 csk., Hamburg, Order; 32 csk., Liverpool, Order; 80 csk., Liverpool, D. Bacon; 61 csk., Liverpool, Order. **Peanut**—400 bbl., London, E. F. Drew & Co. **Perilla**—500 dr., Kobe, Am. Express Co.; 525 bbl., Dairen, Int'l Banking Corp.; 400 bbl., Dairen, Bank of N. Y. **Rapeseed**—125 bbl., London, Order. **Sardine**—2,000 cs., Kobe, Bank of America; 200 cs, Kobe, Lee, Higginson & Co.; 2,000 cs., Yokohama, Order. **Linseed**—286 bbl., Rotterdam, J. C. Francesconi & Co. **Sesame**—569 bbl., Rotterdam, Nat'l City Bank.

PHOSPHATE, BONE—304 bags, Rotterdam, H. J. Baker & Bros.

PLUMBAGO—308 bbl., Colombo, Goldman, Sachs & Co.; 100 bbl., Colombo, H. W. Peabody & Co.; 564 bbl., Colombo, H. P. Winter & Co.; 308 bbl., Colombo, First Fed. Banking Corp.

POTASSIUM SALTS—29 csk., nitrate, Hamburg, Order; 50 cs. caustic, Gothenburg, Mallinckrodt Chemical Works; 5,317 pkg. muriate, Bremen, A. Vogel; 15 cs. carbonate, Bremen, P. H. Petry & Co.; 32 dr. bicarbonate, Rotterdam, Meteor Prod. Co.; 100 cs. bromide, 206 csk. caustic, 107 pkg. aetz, Hamburg, Roessler & Hasslacher Chem. Co.; 440 cs. bromide, Hamburg, Superfos Co.; 56 csk. product, Hamburg, A. Klipstein & Co.; 101 dr. caustic, Hamburg, A. Klipstein & Co.; 40 dr. caustic, Hamburg, A. Klipstein & Co.; 44 csk. salts, Hamburg, Roessler & Hasslacher Chem. Co.; 270 cs. cyanide, Hamburg, Roessler & Hasslacher Chem. Co.; 100 cs. alum, Hamburg, A. Klipstein & Co.; 322 csk. alum, Hamburg, Order; 16 csk. bisulphide, Hamburg, Order; 310 bbl. chlorate, Hamburg, Order; 28 csk. carbonate, Hamburg, Order; 3,164 bags muriate, Bremen, A. Vogel; 22 bbl. perchloride, Swansea, Order; 5,500 bags muriate, 1,500 bags sulphate, Antwerp, Société Comm. des Potasses D'Alsace; 125 bbl. chlorate, 20 bbl. perchlorate, Marseilles, Nat'l City Bank; 250 bbl. chlorate, Marseilles, Order; 4 csk. prussiate, Antwerp, Order; 46 csk. carbonate, Antwerp, Order.

QUEBRACHO—20,997 logs, Santa Fe, Tannin Corp.

SAL AMMONIAC—73 csk., Meteor Products Co.; 36 bbl., Hamburg, J. A. Van Brunt & Co.; 94 csk., Hamburg, Order; 76 bbl., Hamburg, Order.

phate, Antwerp, Société Comn. des Potasses

SEEDS—Castor—1,426 bags, Bombay, Folkart Bros.; 10,245 bags, Cocanada, Order; 16,296 bags, Cocanada, Ralli Bros.; 12,977 bags, Cocanada, Order. **Linseed**—22,430 bags, Rosario, Spencer Kellogg & Sons; 105,264 bags, Buenos Aires, Order; 30,294 bags, Buenos Aires, Merchants Nat'l Bank of Boston; 8,524 bags, Rosario, Order.

SHELLAC — 130 bags, Calcutta, Phil. Nat'l Bank; 100 bags, Calcutta, London & Liverpool Bank of Commerce; 100 bags, Calcutta, Arbuthnot, Latham & Co.; 600 pkg., Calcutta, Order; 100 bags, Hamburg, A. Murphy & Co.; 11 bags, Hamburg, Kasebier-Chatfield Shellac Co.; 50 cs., Bremen, Order; 100 bags, London, Order; 2,182 bags, Southampton, Order; 75 bags, Calcutta, Cont. Comm. Nat'l Bank; 319 pkg., Calcutta, Irving Nat'l Bank; 290 pkg., Calcutta, Lee, Higginson & Co.; 52 bags, Calcutta, First Nat'l Bank of Boston; 100 pkg., Calcutta, Brown Bros. & Co.; 100 pkg., Calcutta, London & Liverpool Bank of Commerce; 1,050 pkg., Calcutta, Order; 1,625 pkg. refuse lac, Calcutta, Order; 141 pkg., Karachi, Order; 156 bags sticklac, Marseilles, Order.

SODIUM SALTS—5,667 bags nitrate, Antofagasta, W. R. Grace & Co.; 11,286 bags nitrate, Iquique, W. R. Grace & Co.; 500 csk. nitrate, Hamburg, Kuttroff, Pickhardt & Co.; 20 dr. perborate, Hamburg, Bank of America; 122 csk. sulph., Hamburg, Roessler & Hasslacher Chem. Co.; 43 dr. sulphide, Hamburg, Order; 81 dr. sulphide, Hamburg, Order; 180 cs. cyanide, Marseilles, Asia Banking Corp.; 99 bbl. hyposulphide, Antwerp, Cooper & Cooper; 128 dr. sulphide, Antwerp, J. D. Leis; 17 csk. prussiate, Liverpool, Guaranty Trust Co.; 35 csk. prussiate, Baker Bros.

STARCH, POTATO—1,250 bags, Rotterdam, Stein, Hall & Co.

STRONTIUM NITRATE—44 csk., Hamburg, Roessler & Hasslacher.

SUMAC—700 bags, Palermo, Equitable Trust Co.; 300 bales, Palermo, Order.

TARTAR, CRUDE—16 pkg., Valparaiso, National City Bank; 668 bags, Marseilles, Tartar Chem. Works; 105 bags, Marseilles, C. Pfizer & Co.

TALC—1,000 bags, Bordeaux, L. A. Solomon & Bro.; 500 bags, Bordeaux, Hammil & Gillespie; 800 bags, Bordeaux, Order; 62 cs., Bordeaux, Binney & Smith.

TALLOW, VEGETABLE — 500 pkg., Hankow, Arnhold Bros.; 500 pkg., Hankow, Am. Linseed Co.

TALLOW, ANIMAL—558 csk., 16 pipes, Melbourne, D. Bruce & Co.

WHITING — 500 bags, Bristol, L. H. Butcher & Co.; 90 bbl., Antwerp, Order.

WOOL GREASE—75 bbl., Manchester, Am. Trust Co.

ZINC OXIDE—10 bbl., Marseilles, Order; 300 bbl., Antwerp, Brown Bros. & Co.

ZINC WHITE — 100 bbl., Marseilles, Reichard, Coulston, Inc.

Current Prices in the New York Market

For Chemicals, Oils and Allied Products

General Chemicals

Acetic anhydride, 85%, drums	lb.	$0.38 –	....
Acetone, drums	lb.	.22 –	.23
Acid, acetic, 28%, bbl.	100 lb.	3.17½ –	3.92½
Acetic, 56%, bbl.	100 lb.	6.35 –	6.37
Glacial, 99½%, bbl.	100 lb.	12.05 –	12.85
Boric, bbl.	lb.	.11 –	.11½
Citric, kegs	lb.	.49 –	.50
Formic, 85%	lb.	.14½ –	.17
Gallic, tech.	lb.	.45 –	.50
Hydrochloric, 18° tanks	100 lb.	.90 –	1.00
Hydrofluoric, 52%, carboys	lb.	.12 –	.12½
Lactic, 44%, tech., light, bbl.	lb.	.11½ –	.12
22% tech., light, bbl.	lb.	.05½ –	.06
Muriatic, 20°, tanks	100 lb.	1.00 –	1.10
Nitric, 36°, carboys	lb.	.04½ –	.05
Nitric, 42°, carboys	lb.	.06 –	.06½
Oleum, 20%, tanks	ton	18.50 –	19.00
Oxalic, crystals, bbl.	lb.	.13½ –	.14
Phosphoric, 50% carboys	lb.	.07½ –	.08½
Pyrogallic, resublimed	lb.	1.50 –	1.60
Sulphuric, 60°, tanks	ton	9.00 –	10.00
Sulphuric, 60°, drums	ton	12.00 –	14.00
Sulphuric, 66°, tanks	ton	15.00 –	15.50
Sulphuric, 66° drums	ton	19.00 –	20.00
Tannic, U.S.P., bbl.	lb.	.65 –	.70
Tannic, tech., bbl.	lb.	.45 –	.50
Tartaric, imp. crys., bbl.	lb.	.34 –	....
Tartaric, imp., powd., bbl.	lb.	.34 –	....
Tartaric, domestic, bbl.	lb.	.35 –	....
Tungstic, per lb.	lb.	1.00 –	1.20
Alcohol, butyl, drums, f.o.b. works	lb.	.27 –	.29
Alcohol ethyl (Cologne spirit), bbl.	gal.	4.75 –	4.95
Alcohol, methyl (see Methanol)			
Alcohol, denatured, 188 proof No. 1, bbl.	gal.	.39 –	.40
Alum, ammonia, lump, bbl.	lb.	.03½ –	.03½
Potash, lump, bbl.	lb.	.03 –	.03½
Chrome, lump, potash, bbl.	lb.	.05½ –	.05½
Aluminum sulphate, com., bags	100 lb.	1.50 –	1.65
Iron free bags	lb.	.02½ –	.02½
Aqua ammonia, 26°, drums	lb.	.06½ –	.07½
Ammonia, anhydrous, cyl.	lb.	.30 –	.30½
Ammonium carbonate, powd. casks, imported	lb.	.09½ –	.10
Ammonium carbonate, powd. domestic, bbl.	lb.	.13 –	.14
Ammonium nitrate, tech., casks	lb.	.10 –	.11
Amyl acetate tech., drums	gal.	3.50 –	3.75
Arsenic, white, powd., bbl.	lb.	.15½ –	.16
Arsenic, red, powd., kegs	lb.	.14½ –	.15
Barium carbonate, bbl.	ton	78.00 –	80.00
Barium chloride, bbl.	ton	90.00 –	95.00
Barium dioxide, drums	lb.	.18 –	.18½
Barium nitrate, casks		.08 –	.08½
Barium sulphate, bbl.	lb.	.04 –	.04½
Blanc fixe, dry, bbl.	lb.	.04½ –	.04½
Blanc fixe, pulp, bbl.	ton	45.00 –	55.00
Bleaching powder, f.o.b. wks., drums	100 lb.	2.15 –	....
Spot N. Y. drums	100 lb.	2.60 –	2.70
Borax, bbl.	lb.	.05½ –	.05½
Bromine, cases	lb.	.28 –	.30
Calcium acetate, bags	100 lb.	3.50 –	3.60
Calcium carbide, drums	lb.	.04½ –	.04½
Calcium chloride, fused, drums	ton	22.00 –	23.00
Gran. drums	lb.	.01½ –	.01½
Calcium phosphate, mono, bbl.	lb.	.06½ –	.07
Camphor, cases	lb.	.91 –	.93
Carbon bisulphide, drums	lb.	.07 –	.07½
Carbon tetrachloride, drums	lb.	.10 –	....
Chalk, precip.—domestic, light, bbl.	lb.	.04½ –	.04½
Domestic, heavy, bbl.	lb.	.03½ –	.03½
Imported, light, bbl.	lb.	.04½ –	.05
Chlorine, liquid, cylinders	lb.	.06 –	.06½
Chloroform, tech., drums	lb.	.35 –	.38
Cobalt oxide, bbl.	lb.	2.10 –	2.25
Copperas, bulk, f.o.b. wks.	ton	16.50 –	20.00
Copper carbonate, bbl.	lb.	.19 –	.20
Copper cyanide, drums	lb.	.47 –	.50
Coppersulphate, crys., bbl.	100 lb.	6.25 –	6.50
Cream of tartar, bbl.	lb.	.25½ –	.26½
Epsom salt, dom., tech., bbl.	100 lb.	2.00 –	2.25
Epsom salt, imp., tech., bags	100 lb.	1.10 –	1.25
Epsom salt, U.S.P., dom., bbl.	100 lb.	2.50 –	2.75
Ether, U.S.P., drums	lb.	.13 –	.15
Ethyl acetate, com., 85%, drums	gal.	.80 –	.85
Ethyl acetate, pure (acetic ether, 98% to 100%)	gal.	.95 –	1.00
Formaldehyde, 40%, bbl.	lb.	.14½ –	.16
Fullers earth, f.o.b. mines	net ton	16.00 –	17.00
Fullers earth—imp., powd.	net ton	30.00 –	32.00
Fusel oil, ref., drums	gal.	3.55 –	4.05
Fusel oil, crude, drums	gal.	2.30 –	2.40
Glaubers salt, wks., bags	100 lb.	1.20 –	1.40

THESE prices are for the spot market in New York City, but a special effort has been made to report American manufacturers' quotations whenever available. In many cases these are for material f.o.b. works or on a contract basis and these prices are so designated. Quotations on imported stocks are reported when they are of sufficient importance to have a material effect on the market. Prices quoted in these columns apply to large quantities in original packages.

Glaubers salt, imp., bags	100 lb.	$1.00 –	$1.25
Glycerine, c.p., drums extra	lb.	.18 –	.18½
Glycerine, dynamite, drums	lb.	.16½ –	....
Iodine, resublimed	lb.	4.55 –	4.65
Iron oxide, red, casks	lb.	.12 –	.18
Lead:			
White, basic carbonate, dry, casks	lb.	.09½ –	.10½
White, basic sulphate, casks	lb.	.09½ –	....
White, in oil, kegs	lb.	.12½ –	.14
Red, dry, casks	lb.	.11½ –	.12
Red, in oil, kegs	lb.	.13½ –	.15
Lead acetate, white crys., bbl.	lb.	.13½ –	.14
Brown, broken, casks	lb.	.12½ –	....
Lead arsenate, powd., bbl.	lb.	.23 –	.24
Lime-Hydrated, bbl.	per ton	16.80 –	17.00
Lime, Lump, bbl.	280 lb.	3.63 –	3.65
Litharge, comm., casks	lb.	.10½ –	.11
Lithophone, bags	lb.	.07 –	.07½
in bbl.	lb.	.07½ –	.07½
Magnesium carb., tech., bags	lb.	.08 –	.08½
Methanol, 95%, bbl.	gal.	1.21 –	1.23
Methanol, 97%, bbl.	gal.	1.23 –	1.25
Nickel salt, double, bbl.	lb.	.10½ –	....
Nickel salts, single, bbl.	lb.	.11½ –	....
Phosgene	....	.60 –	.75
Phosphorus, red, cases	lb.	.35 –	.40
Phosphorus, yellow, cases	lb.	.30 –	.35
Potassium bichromate, casks	lb.	.11 –	.11½
Potassium bromide, gran., bbl.	lb.	.16 –	.23
Potassium carbonate, 80-85%, calcined, casks	lb.	.06 –	.06½
Potassium chlorate, powd.	lb.	.07 –	.08
Potassium cyanide, drums	lb.	.45 –	.50
Potassium hydroxide (caustic potash) drums	100 lb.	8.25 –	8.50
Potassium iodide, cases	lb.	3.65 –	3.75
Potassium nitrate, bbl.	lb.	.06½ –	.07½
Potassium permanganate, drums	lb.	.25½ –	.25½
Potassium prussiate, red, casks	lb.	.80 –	.85
Potassium prussiate, yellow, casks	lb.	.37½ –	.38
Salammoniac, white, gran., casks, imported	lb.	.07 –	.07½
Salammoniac, white, gran., bbl., domestic	lb.	.07½ –	.08
Gray, gran., casks	lb.	.08 –	.09
Salsoda, bbl.	100 lb.	1.20 –	1.40
Salt cake (bulk)	ton	26.00 –	28.00
Soda ash, light, 58% flat, bags, contract	100 lb.	1.60 –	1.67
Soda ash, light, basis, 48%, bags, contract, f.o.b. wks.	100 lb.	1.20 –	1.30
Soda ash, light, 58%, flat, bags, resale	100 lb.	1.75 –	1.80
Soda ash, dense, bags, contract, basis 48%	100 lb.	1.17½ –	1.20
Soda ash, dense, in bags, resale	100 lb.	1.85 –	1.90
Soda, caustic, 76%, solid, drums, f.a.s.	100 lb.	3.45 –	3.70
Soda, caustic, 76%, solid, drums, contract	100 lb.	3.35	3.40
Soda, caustic, basis 60%, wks., contract	100 lb.	2.50 –	2.60
Soda, caustic, ground and flake, contracts	100 lb.	3.80 –	3.90
Soda, caustic, ground and flake, resale	100 lb.	4.00 –	4.15
Sodium acetate, works, bags	lb.	.06 –	.06½
Sodium bicarbonate, bbl.	100 lb.	2.00 –	2.50
Sodium bichromate, casks	lb.	.07½ –	.08
Sodium bisulphate (niter cake)	ton	6.00 –	7.00
Sodium bisulphite, powd., U.S.P., bbl.	lb.	.04½ –	.04½
Sodium chlorate, kegs	lb.	.06½ –	.07
Sodium chloride	long ton	12.00 –	13.00
Sodium cyanide, cases	lb.	.20 –	.23
Sodium fluoride, bbl.	lb.	$0.09 –	$0.10
Sodium hyposulphite, bbl.	lb.	.02½ –	.03
Sodium nitrite, casks	lb.	.08½ –	.09
Sodium peroxide, powd., cases	lb.	.28 –	.30
Sodium phosphate, dibasic, bbl.	lb.	.03½ –	.04
Sodium prussiate, yel. drums	lb.	.18½ –	.19
Sodium silicate (40°, drums)	100 lb.	.80 –	1.25
Sodium silicate (60°, drums)	100 lb.	2.00 –	2.25
Sodium sulphide, fused, 60-62% drums	lb.	.04½ –	.04½
Sodium sulphite, crys., bbl.	lb.	.03½ –	.03½
Strontium nitrate, powd., bbl.	lb.	.09½ –	.10
Sulphur chloride, yel drums	lb.	.04½ –	.05
Sulphur, crude	ton	18.00 –	20.00
At mine, bulk	ton	16.00 –	18.00
Sulphur, flour, bbl.	100 lb.	2.35 –	3.15
Sulphur, roll, bbl.	100 lb.	2.00 –	2.50
Sulphur dioxide, liquid, cyl.	lb.	.08 –	.08½
Talc—imported, bags	ton	30.00 –	40.00
Talc—domestic powd., bags	ton	18.00 –	25.00
Tin bichloride, bbl.	lb.	.13½ –	.14
Tin oxide, bbl.	lb.	.52 –	.54
Zinc carbonate, bags	lb.	.14 –	.14½
Zinc chloride, gran, bbl.	lb.	.06 –	.07
Zinc cyanide, drums	lb.	.37 –	.38
Zinc oxide, lead free, bbl.	lb.	.08 –	.08½
5% lead sulphate, bags	lb.	.07½ –	....
10 to 35 % lead sulphate, bags	lb.	.07 –	....
French, red seal, bags	lb.	.09½ –	....
French, green seal, bags	lb.	.10½ –	....
French, white seal, bbl.	lb.	.12 –	....
Zinc sulphate, bbl.	100 lb.	2.75 –	3.00

Coal-Tar Products

Alpha-naphthol, crude, bbl.	lb.	$0.80 –	$0.85
Alpha-naphthol, ref., bbl.	lb.	1.05 –	1.10
Alpha-naphthylamine, bbl.	lb.	.35 –	.36
Aniline oil, drums	lb.	.16 –	.16½
Aniline salts, bbl.	lb.	.24 –	.25
Anthracene, 80%, drums	lb.	.75 –	1.00
Anthracene, 80%, imp., drums, duty paid	lb.	.70 –	.75
Anthraquinone, 25%, paste, drums	lb.	.70 –	.75
Benzaldehyde U.S.P., carboys	lb.	1.40 –	1.45
Benzene, pure, water-white, tanks and drums	gal.	.32 –	.35
Benzene, 90%, tanks & drums	gal.	.27 –	.30
Benzene, 90%, drums, resale	gal.	.30 –	.33
Benzidine base, bbl.	lb.	.85 –	.90
Benzidine sulphate, bbl.	lb.	.75 –	.80
Benzoic acid, U.S.P., kegs	lb.	.72 –	.75
Benzoate of soda, U.S.P., bbl.	lb.	.57 –	.65
Benzyl chloride, 95-97%, ref., drums	lb.	.25 –	.27
Benzyl chloride, tech., drums	lb.	.20 –	.23
Beta-naphthol, subl., bbl.	lb.	.55 –	.60
Beta-naphthol, tech., bbl.	lb.	.23½ –	.24
Beta-naphthylamine, tech.	lb.	.80 –	.90
Carbazol, bbl.	lb.	.75 –	.90
Cresol, U.S.P., drums	lb.	.25 –	.29
Ortho-cresol, drums	lb.	.24 –	.26
Cresylic acid, 97%, resale, drums	gal.	1.40 –	1.50
95-97%, drums, resale	gal.	1.30 –	1.30
Dichlorbenzene, drums	lb.	.07 –	.09
Diethylaniline, drums	lb.	.50 –	.60
Dimethylaniline, drums	lb.	.42 –	.43
Dinitrobenzene, bbl.	lb.	.19 –	.20
Dinitroclorbenzene, bbl.	lb.	.22 –	.23
Dinitronaphthalene, bbl.	lb.	.30 –	.32
Dinitrophenol, bbl.	lb.	.35 –	.40
Dinitrotoluene, bbl.	lb.	.20 –	.22
Dip oil, 25%, drums	gal.	.25 –	.30
Diphenylamine, bbl.	lb.	.50 –	.52
H-acid, bbl.	lb.	.80 –	.85
Meta-phenylenediamine, bbl.	lb.	.95 –	1.00
Michlers ketone, bbl.	lb.	3.00 –	3.50
Monochlorbenzene, drums	lb.	.08 –	.10
Monoethylaniline, drums	lb.	.95 –	1.10
Naphthalene, crushed, bbl.	lb.	.08 –	.09
Naphthalene, flake, bbl.	lb.	.09½ –	.10
Naphthalene, balls, bbl.	lb.	.10½ –	.11
Naphthionate of soda, bbl.	lb.	.58 –	.65
Naphthionic acid, crude, bbl.	lb.	.60 –	.65
Nitrobenzene, drums	lb.	.10 –	.12
Nitro-naphthalene, bbl.	lb.	.30 –	.35
Nitro-toluene, drums	lb.	.15 –	.17
N-W acid, bbl.	lb.	1.25 –	1.30
Ortho-amidophenol, kegs	lb.	2.30 –	2.35
Ortho-dichlorbenzene, drums	lb.	.17 –	.20
Ortho-nitrophenol, bbl.	lb.	.90 –	.92
Ortho-nitrotoluene, drums	lb.	.10 –	.12
Ortho-toluidine, bbl.	lb.	.13 –	.15
Para-amidophenol, base, kegs	lb.	1.15 –	1.20
Para-amidophenol, HCl, kegs	lb.	1.20 –	1.25
Para-dichlorbenzene, bbl.	lb.	.17 –	.20
Paranitraniline, bbl.	lb.	.74 –	.75
Para-nitrotoluene, bbl.	lb.	.55 –	.65
Para-phenylenediamine, bbl.	lb.	1.45 –	1.50
Para-toluidine, bbl.	lb.	.95 –	.98
Phthalic anhydride, bbl.	lb.	.35 –	.38
Phenol, U.S.P., drums	lb.	.50 –	.55
Picric acid, bbl.	lb.	.20 –	.22
Pyridine, dom., drums	gal.	nominal	
Pyridine, imp., drums	gal.	2.50 –	2.75

Resorcinol, tech., kegs	lb.	$1.50 – $1.55
Resorcinol, pure, kegs	lb.	2.00 – 2.10
R-salt, bbl	lb.	.55 – .60
Salicylic acid, tech., bbl	lb.	.47 – .48
Salicylic acid, U.S.P., bbl	lb.	.50 – .52
Solvent naphtha, water-white, drums	gal.	.37 – .40
Crude, drums	gal.	.22 – .24
Sulphanilic acid, crude, bbl	lb.	.18 – .22
Thiocarbanilide, kegs	lb.	.35 – .38
Toluidine, kegs	lb.	1.20 – 1.30
Toluidine, mixed, kegs	lb.	.30 – .35
Toluene, tank cars	gal.	.30 – .35
Toluene, drums	gal.	.35 – .40
Xylidines drums	lb.	.40 – .45
Xylene, pure, drums	gal.	.45 – .50
Xylene, com., drums	gal.	.35 – .37
Xylene, com., tanks	gal.	.30 – ......

Naval Stores

Rosin B-D, bbl	280 lb.	$6.20 – ......
Rosin E-I, bbl	280 lb.	6.30 – ......
Rosin K-N, bbl	280 lb.	6.35 – 6.75
Rosin W.G.-W.W., bbl	280 lb.	7.00 – 8.00
Wood rosin, bbl	280 lb.	6.25 – ......
Turpentine, spirits of, bbl	gal.	1.60 – 1.62
Wood, steam dist., bbl	gal.	1.35 – ......
Wood, dest. dist., bbl	gal.	1.25 – ......
Pine tar pitch, bbl	200 lb.	...... – 6.00
Tar, kiln burned, bbl	500 lb.	...... – 12.00
Retort tar, bbl	500 lb.	...... – 11.00
Rosin oil, first run, bbl	gal.	.43 – ......
Rosin oil, second run, bbl	gal.	.47 – ......
Rosin oil, third run, bbl	gal.	.53 – ......
Pine oil, steam dist.	gal.	...... – .90
Pine oil, pure, dest. dist.	gal.	...... – .85
Pine tar oil, ref.	gal.	...... – .46
Pine tar oil, crude, tanks f.o.b. Jacksonville, Fla.	gal.	...... – .35
Pine tar oil, double ref., bbl	gal.	...... – .75
Pine tar, ref., thin, bbl	gal.	...... – .25
Pinewood creosote, ref., bbl.	gal.	...... – .52

Animal Oils and Fats

Degras, bbl	lb.	$0.03½ – $0.04¼
Grease, yellow, bbl	lb.	.08¼ – .08¾
Lard oil, Extra No. 1, bbl	gal.	.92 – .94
Neatsfoot oil, 20 deg. bbl	gal.	1.28 – 1.32
No. 1, bbl	gal.	.92 – .94
Red oil, distilled, d.p. bbl	lb.	.11½ – ......
Saponified, bbl	lb.	.11½ – ......
Tallow, extra, loose	lb.	.09 – ......
Tallow oil, acidless, bbl	gal.	.96 – .98

Vegetable Oils

Castor oil, No. 3, bbl	lb.	$0.13¼ – $0.13¾
Castor oil, No. 1, bbl	lb.	.14 – .14½
Chinawood oil, bbl	lb.	.32½ – .35
Coconut oil, Ceylon, bbl	lb.	.10½ – .10¾
Ceylon, tanks, N.Y.	lb.	.09½ – .09¾
Coconut oil, Cochin, bbl	lb.	.10¾ – ......
Corn oil, crude, bbl	lb.	.12½ – ......
Crude, tanks, (f.o.b. mill)	lb.	.10½ – .10¾
Cottonseed oil, crude (f.o.b. mill), tanks	lb.	.10½ – .10¾
Summer yellow, bbl	lb.	.12½ – .13
Winter yellow, bbl	lb.	.13½ – .13¾
Linseed oil, raw, car lots, bbl.	gal.	1.14 – ......
Raw, tank cars (dom.)	gal.	1.09 – ......
Boiled, cars, bbl. (dom.)	gal.	1.16 – ......
Olive oil, denatured, bbl	gal.	1.10 – 1.15
Sulphur, (foots) bbl	lb.	.07½ – .09¼
Palm, Lagos, casks	lb.	.08½ – .08¾
Niger, casks	lb.	.08½ – .08¾
Palm kernel, bbl	lb.	.09½ – .09¾
Peanut oil, crude, tanks (mill)	lb.	.13½ – .13¾
Peanut oil, refined, bbl	lb.	.17 – ......
Perilla, bbl	lb.	.15 – .16
Rapeseed oil, refined, bbl	gal.	.84 – .85
Rapeseed oil, blown, bbl	gal.	.90 – .91
Sesame, bbl	lb.	.13 – .13½
Soya bean (Manchurian), bbl.	lb.	.12½ – ......
Tank, f.o.b. Pacific coast	lb.	.10½ – .10¾
Tank, (f.o.b. N.Y.)	lb.	.10¾ – .11

Fish Oils

Cod, Newfoundland, bbl	gal.	$0.70 – $0.72
Menhaden, light pressed, bbl.	gal.	$0.70 – ......
White bleached, bbl	gal.	.72 – .74
Blown, bbl	gal.	.76 – .78
Crude, tanks (f.o.b. factory)	gal.	.50 – .52
Whale No. 1 crude, tanks, coast	lb.	.06½ – ......
Winter, natural, bbl	gal.	.76 – .78
Winter, bleached, bbl	gal.	.79 – .80

Oil Cake and Meal

Coconut cake, bags	ton	$38.00 – $40.00
Copra, sun dried, bags, (c.i.f.)	lb.	.06½ – .06¾
Sun dried Pacific coast	lb.	.05½ – .05¾
Cottonseed meal, f.o.b. mills	ton	40.00 – 41.00
Linseed cake, bags	ton	35.00 – 36.00
Linseed meal, bags	ton	38.00 – ......

Dye & Tanning Materials

Albumen, blood, bbl	lb.	$0.45 – $0.50
Albumen, egg, tech, kegs	lb.	.72 – .75
Cochineal, bags	lb.	.35 – .36
Cutch, Borneo, bales	lb.	.04½ – .05
Cutch, Rangoon, bales	lb.	.12 – .12½
Dextrine, corn, bags	100 lb.	3.39 – ......
Dextrine, gum, bags	100 lb.	3.74 – ......
Divi-divi, bags	ton	38.00 – 39.00
Fustic, sticks	ton	30.00 – 35.00
Fustic, chips, bags	lb.	.04 – .05
Logwood, sticks	ton	28.00 – 30.00
Logwood, chips, bags	lb.	.02½ – .03½
Sumac, leaves, Sicily, bags	ton	65.00 – ......
Sumac, ground, bags	ton	$55.00 – $60.00
Sumac, domestic, bags	ton	35.00 – ......
Tapioca flour, bags	lb.	.03½ – .05

Extracts

Archil, conc., bbl	lb.	$0.17 – $0.18
Chestnut, 25% tannin, tanks.	lb.	.02 – .03
Divi-divi, 25% tannin, bbl	lb.	.04 – .05
Fustic, crystals, bbl	lb.	.20 – .22
Fustic, liquid, 42°, bbl	lb.	.08 – .09
Gambier, liq., 25% tannin, bbl.	lb.	.08 – .09
Hematine crys., bbl	lb.	.14 – .18
Hemlock, 25% tannin, bbl	lb.	.04 – .05
Hypernic, solid, drums	lb.	.24 – .26
Hypernic, liquid, 51°, bbl	lb.	.14 – .17
Logwood, crys., bbl	lb.	.19 – .20
Logwood, liq., 51°, bbl	lb.	.09 – .10
Quebracho, solid, 65% tannin, bbl	lb.	.04¼ – .05
Sumac, dom., 51°, bbl	lb.	.06¼ – .07

Dry Colors

Blacks–Carbongas, bags, f.o.b. works	lb.	$0.16 – $0.18
Lampblack, bbl	lb.	.12 – .40
Mineral, bulk	ton	35.00 – 45.00
Blues–Bronze, bbl	lb.	.55 – .60
Prussian, bbl	lb.	.55 – .60
Ultramarine, bbl	lb.	.08 – .35
Browns, Sienna, Ital., bbl	lb.	.06 – .14
Sienna, Domestic, bbl	lb.	.03½ – .04
Umber, Turkey, bbl	lb.	.04 – .04½
Greens–Chrome, C.P.Light, bbl	lb.	.32 – .34
Chrome, commercial, bbl	lb.	.12 – .12½
Paris, bulk	lb.	.30 – .35
Reds, Carmine No. 40, tins	lb.	4.50 – 4.70
Oxide red, casks	lb.	.10 – .14
Para toner, kegs	lb.	1.00 – 1.10
Vermilion, English, bbl	lb.	1.30 – 1.32
Yellow, Chrome, C.P. bbls	lb.	.20 – .21
Ocher, French, casks	lb.	.02½ – .03

Waxes

Bayberry, bbl	lb.	$0.28 – $0.30
Beeswax, crude, bags	lb.	.21 – .25
Beeswax, refined, light, bags	lb.	.34 – .35
Beeswax, pure white, cases	lb.	.40 – .41
Candellila, bags	lb.	.24 – .25
Carnauba, No. 1, bags	lb.	.39 – .40
No. 2, North Country, bags	lb.	.23 – .23½
No. 3, North Country, bags	lb.	.19½ – ......
Japan, cases	lb.	.14½ – .15
Montan, crude, bags	lb.	.04 – .04¾
Paraffine, crude, match, 105-110 m.p.	lb.	.04¼ – .04½
Crude, scale 124-126 m.p., bags	lb.	.03 – .03¾
Ref., 118-120 m.p., bags	lb.	.03½ – ......
Ref., 125 m.p., bags	lb.	.03¾ – ......
Ref, 128-130 m.p., bags	lb.	.04 – .04¼
Ref., 133-135 m.p., bags	lb.	.04½ – .04¾
Ref., 135-137 m.p., bags	lb.	.05 – .05¼
Stearic acid, sgle pressed, bags	lb.	.14 – ......
Double pressed, bags	lb.	.14½ – ......
Triple pressed, bags	lb.	.16 – ......

Fertilizers

Ammonium sulphate, bulk, f.o.b. works	100 lb.	$3.30 – $3.40
F.a.s. double bags	100 lb.	4.15 – 4.25
Blood, dried, bulk	unit	4.60 – ......
Bone, raw, 3 and 50, ground	ton	30.00 – 35.00
Fish scrap, dom., dried, wks.	unit	5.00 – 5.10
Nitrate of soda, bags	100 lb.	2.65 – 2.67½
Tankage, high grade, f.o.b. Chicago	unit	4.70 – 4.80
Phosphate rock, f.o.b. mines, Florida pebble, 68-72%	ton	$4.00 – $4.50
Tennessee, 78-80%	ton	8.00 – 8.25
Potassium muriate, 80%, bags	ton	35.00 – 36.00
Potassium sulphate, bags	unit	1.00 – ......

Crude Rubber

Para—Upriver fine	lb.	$0.30 – ......
Upriver coarse	lb.	.26½ – ......
Upriver caucho ball	lb.	.28½ – ......
Plantation—First latex crepe	lb.	.33¾ – ......
Ribbed smoked sheets	lb.	.33¾ – ......
Brown crepe, thin, clean	lb.	.32 – ......
Amber crepe No. 1	lb.	.32½ – ......

Gums

Copal, Congo, amber, bags	lb.	$0.18½ – $0.19
East Indian, bold, bags	lb.	.22 – .23
Manila, pale, bags	lb.	.21 – .22
Pontinak, No. 1 bags	lb.	.21 – .22
Damar, Batavia, cases	lb.	.31 – .32
Singapore, No. 1, cases	lb.	.34 – .35
Kauri, No. 1, cases	lb.	.62 – .66
Ordinary chips, cases	lb.	.18 – .20
Manjak, Barbados, bags	lb.	.09 – .09½

Shellac

Shellac, orange fine, bags	lb.	$0.80 – ......
Orange superfine, bags	lb.	.82 – ......
A. C. garnet, bags	lb.	.78 – .79
Bleached, bonedry	lb.	90 – ......
Bleached, fresh	lb.	77 – .78
T. N., bags	lb.	.76 – ......

Miscellaneous Materials

Asbestos, crude No. 1, f.o.b., Quebec	sh. ton	$450.00 – $550.00
Asbestos, shingle, f.o.b., Quebec	sh. ton	$60.00 – $80.00
Asbestos, cement, f.o.b., Quebec	sh. ton	15.00 – 17.00
Barytes, grd., white, f.o.b. mills, bbl.	net ton	16.00 – 20.00
Barytes, grd., off-color, f.o.b. mills bulk	net ton	13.00 – 15.00
Barytes, floated, f.o.b. St. Louis, bbl	net ton	28.00 – ......
Barytes, crude f.o.b. mines, bulk	net ton	10.00 – 11.00
Casein, bbl., tech	lb.	.11 – .12
China clay (kaolin) crude, f.o.b. Ga.	net ton	7.00 – 9.00
Washed, f.o.b. Ga.	net ton	8.00 – 9.00
Powd., f.o.b. Ga.	net ton	13.00 – 20.00
Crude f.o.b. Va.	net ton	8.00 – 12.00
Ground, f.o.b. Va.	net ton	13.00 – 20.00
Imp., lump, bulk	net ton	15.00 – 20.00
Imp., powd.	net ton	45.00 – 50.00
Feldspar, No. 1 pottery	long ton	6.00 – 7.00
No. 2 pottery	long ton	5.00 – 5.50
No. 1 soap	long ton	7.00 – 7.50
No. 1 Canadian, f.o.b. mill	long ton	25.00 – 27.00
Graphite, Ceylon, lump, first quality, bbl	lb.	.06 – .06½
Ceylon, chip, bbl.	lb.	.05 – .05½
High grade amorphous crude	ton	35.00 – 50.00
Gum arabic, amber, sorts, bags	lb.	.15 – .16
Gum tragacanth, sorts, bags	lb.	.50 – .60
No. 1, bags	lb.	1.75 – 1.80
Kieselguhr, f.o.b. Cal.	ton	40.00 – 42.00
F.o.b. N. Y.	ton	50.00 – 55.00
Magnesite, crude, f.o.b. Cal.	ton	14.00 – 15.00
Pumice stone, imp., casks	lb.	.03 – .05½
Dom., lump, bbl.	lb.	.05 – .05½
Dom., ground, bbl.	lb.	.06 – .07
Silica, glass sand, f.o.b. Ind.	ton	2.00 – 2.50
Silica, sand blast, f.o.b. Ind.	ton	2.50 5.00
Silica, amorphous, 250-mesh, f.o.b. Ill.	ton	17.00 – 17.50
Silica, bldg. sand, f.o.b. Pa.	ton	2.00 – 2.75
Soapstone, coarse, f.o.b. Vt., bags	ton	7.00 – 8.00
Talc, 200 mesh, f.o.b., Vt., bags	ton	6.50 – 9.00
Talc, 200 mesh, f.o.b. Ga., bags	ton	7.00 – 9.00
Talc, 200 mesh, f.o.b. Los Angeles, bags	ton	16.00 – 20.00

Mineral Oils

Crude, at Wells

Pennsylvania	bbl.	$4.00 – $4.25
Corning	bbl.	2.30 – ......
Cabell	bbl.	2.76 – ......
Somerset	bbl.	2.55 – 2.60
Illinois	bbl.	2.37 – ......
Indiana	bbl.	2.28 – ......
Kansas and Oklahoma, 28 deg.	bbl.	1.50 – 1.60
California, 35 deg. and up	bbl.	1.45 – ......

Gasoline, Etc.

Motor gasoline, steel bbls	gal.	$0.24½ – ......
Naphtha, V. M. & P. devd, steel bbls	gal	23½ – ......
Kerosene, ref. tank wagon	gal.	.15 – ......
Bulk, W. W. export	gal.	.08 – ......
Lubricating oils:		
Cylinder, Penn., dark	gal.	.27 – .30
Bloomless, 30@31 grav.	gal.	.20 – .22
Paraffin, pale	gal.	.24 – .25
Spindle, 200, pale	gal.	.25 – .26
Petrolatum, amber, bbls	lb.	.05 – .05½
Paraffine wax (see waxes)		

Refractories

Bauxite brick, 56% Al_2O_3, f.o.b. Pittsburgh	ton	$45–50
Chrome brick, f.o.b. Eastern shipping points	ton	50–52
Chrome cement, 40-50% Cr_2O_3	ton	23–27
40-45% Cr_2O_3, sacks, f.o.b. Eastern shipping points	ton	23.00
Fireclay brick, 1st. quality, 9-in. shapes, f.o.b. Ky. wks.	1,000	40–46
2nd. quality, 9-in. shapes, f.o.b. wks.	1,000	36–41
Magnesite brick, 9-in. straight (f.o.b. wks.)	ton	65–68
9-in. arches, wedges and keys	ton	80–85
Scraps and splits	ton	85
Silica brick, 9-in. sizes, f.o.b. Chicago district	1,000	48–50
Silica brick, 9-in. sizes, f.o.b. Birmingham district	1,000	48–50
F.o.b. Mt. Union, Pa.	1,000	42–44
Silicon carbide refract. brick, 9-in.	1,000	1,100.00

Ferro-Alloys

Ferrotitanium, 15-18% f.o.b. Niagara Falls, N. Y.	ton	$200.00 – $225.00
Ferrochromium, per lb. of Cr, 6-8% C	lb.	.11½ .11¾
4-6% C	lb.	.12 – .13
Ferromanganese, 78-82% Mn, Atlantic seabd. duty paid	gr. ton	115.00 – 120.00
Spiegeleisen, 19-21% Mn.	gr. ton	35.00 – 37.00
Ferromolybdenum, 50-60% Mo, per lb Mo	lb.	1.90 – 2.15
Ferrosilicon, 10-15%	gr. ton	38.00 – 40.00
50%	gr. ton	86.00 – 89.00
75%	gr. ton	150.00 – 160.00

Ferrotungsten, 70-80%, per lb. of W	lb.	$0.85 –	$0.90
Ferro-uranium, 35-50% of U. per lb. of U	lb.	6.00 –	....
Ferrovanadium, 30-40%, per lb. of V	lb.	3.75 –	4.00

Ores and Semi-finished Products

Bauxite, dom. crushed, dried, f.o.b. shipping points	ton	$6.50 –	$8.75
Chrome ore, Calif. concentrates, 50% min. Cr_2O_3	ton	22.00 –	23.00
C.i.f. Atlantic seaboard	ton	18.50 –	19.00
Coke, fdry., f.o.b. ovens	ton	8.25 –	8.50
Coke, furnace, f.o.b. ovens	ton	7.00 –	7.25
Fluorspar, gravel, f.o.b. mines' Illinois	ton	21.50 –	....
Ilmenite, 52% TiO_2	lb.	.01¼–	.01½
Manganese ore, 50% Mn, c.i.f. Atlantic seaport	unit	.33 –	....
Manganese ore, chemical (MnO_2)	ton	75.00 –	80.00
Molybdenite, 85% MoS_2, per lb. MoS_2, N. Y.	lb.	.65 –	.70
Monazite, per unit of ThO_2, c.i.f., Atl. seaport	lb.	.06 –	.08
Pyrites, Span., fines, c.i.f. Atl. seaport	unit	.11½–	.12
Pyrites, Span., furnace size, c.i.f. Atl. seaport	unit	.11½–	.12
Pyrites, dom. fines, f.o.b. mines, Ga.	unit	.12	
Rutile, 95% TiO_2	lb.	.12 –	....
Tungsten, scheelite, 60% WO_3 and over, per unit WO_3	unit	8.50 –	8.75
Tungsten, wolframite, 60% WO_3 and over, per unit WO_3	unit	8.00 –	8.25
Uranium ore (carnotite) per lb. of U_3O_8	lb.	3.50 –	3.75
Uranium oxide, 96% per lb. U_3O_8	lb.	2.25 –	2.50
Vanadium pentoxide, 99%	lb.	12.00 –	14.00
Vanadium ore, per lb. V_2O_5	lb.	1.00 –	....
Zircon, washed, iron free, f.o.b. Pablo, Fla.	lb.	.04½–	.13

Non-Ferrous Materials

	Cents per Lb.
Copper, electrolytic	17¼–17½
Aluminum, 98 to 99%	23–24
Antimony, wholesale, Chinese and Japanese	9–9½
Nickel, virgin metal	25–27
Nickel, ingot and shot	29.00
Monel metal, shot and blocks	32.00
Monel metal, ingots	38.00
Monel metal, sheet bars	45.00
Tin, 5-ton lots, Straits	46.75
Lead, New York, spot	8.25
Lead, E. St. Louis, spot	8.20
Zinc, spot, New York	7.85
Zinc, spot, E. St. Louis	7.50

Other Metals

Silver (commercial)	oz.	$0.67½
Cadmium	lb.	1.10
Bismuth (500 lb. lots)	lb.	2.55
Cobalt	lb.	2.65@2.85
Magnesium, ingots, 99%	lb.	1.25–.....
Platinum	oz.	115.00
Iridium	oz.	260.00@275.00
Palladium	oz.	79.00
Mercury	75 lb.	70.00–.....

Finished Metal Products

	Warehouse Price Cents per Lb.
Copper sheets, hot rolled	20.75
Copper bottoms	30.75
Copper rods	20.50
High brass wire	19.50
High brass rods	17.00
Low brass wire	21.10
Low brass rods	22.00
Brazed brass tubing	24.25
Brazed bronze tubing	29.00
Seamless copper tubing	25.25
Seamless high brass tubing	23.50

OLD METALS—The following are the dealers' purchasing prices in cents per pound:

Copper, heavy and crucible	11.30@11.50
Copper, heavy and wire	11.25@11.50
Copper, light and bottoms	9.25@ 9.50
Lead, heavy	5.75@ 6.00
Lead, tea	3.50@ 3.75
Brass, heavy	6.25@ 6.40
Brass, light	5.35@ 5.75
No. 1 yellow brass turnings	6.30@ 6.50
Zinc	3.50@ 4.00

Structural Material

The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses in the cities named:

	New York	Chicago
Structural shapes	$3.29	$3.14
Soft steel bars	3.19	3.04
Soft steel bar shapes	3.19	3.04
Soft steel bands	3.29	3.19
Plates, ¼ to 1 in. thick	3.29	3.14

Industrial

Financial, Construction and Manufacturing News

Construction and Operation

Alabama

HOLT—The Central Iron & Coal Co. has broken ground for the erection of its proposed new 1-story foundry for the production of cast-iron pipe, to be 150x364 ft., estimated to cost $85,000, with machinery.

Arizona

TUCSON—The Tucson Gas, Electric Light & Power Co. will make improvements and extensions in its artificial gas plant to cost about $200,000, including the installation of additional machinery.

Arkansas

FORT SMITH—The Fort Smith Cotton Oil Co., North 1st and G Sts., has plans in progress for the erection of a new fertilizer manufacturing plant, to be 1-story, estimated to cost $25,000, with equipment.

California

LOS ANGELES—The Los Angeles Pressed Brick Co., Frost Bldg., manufacturer of common and semi-vitreous face brick, has plans under consideration for the erection of a new plant with initial output of close to 100,000 bricks per day. A department will be installed for the manufacture of roofing. A tunnel kiln will be constructed. Howard Frost heads the company.

LOS ANGELES (San Pedro)—A 1-story foundry, 150x180 ft., will be constructed by the Walsh Automatic Coupling Co., estimated to cost about $25,000. Farrell & Miller, Western Mutual Life Bldg., Los Angeles, are architects.

LINCOLN—Gladding, McBean & Co. have work under way on extensions at their local clay products plant, to include the installation of additional machinery. A tunnel kiln is being constructed, to be used in connection with roofing tile manufacture.

Connecticut

MIDDLETOWN—The Benevue Co., recently organized, has leased feldspar properties of the Laurel Brick & Sand Co., at Laurel, near Middletown, and plans for the installation of a new plant for commercial feldspar production. Equipment will be provided for initial employment of about 100 operatives. The company also purposes to construct and operate a pottery in this section at a later date.

District of Columbia

WASHINGTON—The Washington Gas Light Co., 411 10th St., N. W., is arranging a construction program for new artificial gas plants, improvements in present plants and system to involve an annual amount of about $1,000,000 for a number of years. Plans for initial work are under consideration.

Illinois

CHICAGO—The National Wood Finishing Co., recently organized to manufacture oils, paints and varnishes, has leased the 2-story and basement building, 50x120 ft., at 2242 Belmont Ave., with option to purchase, for a new plant. An adjoining site, 75x125 ft., has also been secured for later expansion. Machinery will be installed and the plant placed in operation at an early date.

CHICAGO—Brenner, Monley & Morris, Inc., care of Fox & Fox, 38 South Dearborn St., Chicago, architects, has had plans drawn for the construction of a new copper rod and wire mill on Kedzie St., to be 1-story, 105x300 ft., and estimated to cost approximately $250,000, with machinery. Work will be placed under way at an early date.

ROCKFORD—The Sargent-Morse Paper Co., 315 Chestnut St., has tentative plans under consideration for enlargements in its plant, for the manufacture of paper and paper board products. The company was incorporated recently to succeed to an existing business.

CHICAGO—The National Fiber & Vulcanizing Co. has leased the 1-story plant at 2808-14 West Lake St., totaling about 10,000 sq.ft. of space, for a new works. Possession will be taken at once.

Indiana

INDIANAPOLIS—The Ideal Paint Co. has leased a building at 437 East 10th St. for enlargements in its plant. Equipment will be installed at an early date.

SOUTH BEND—A large foundry will be constructed at the plant of the Studebaker Corp., manufacturer of automobiles, estimated to cost close to $200,000. Plans have been drawn and bids called for the general erection.

INDIANAPOLIS—Eberhardt & Co., Greenbrier St., manufacturers of waterproofing compounds and kindred products, have plans nearing completion for the erection of an addition to their plant on Darwin St. and Hillside Ave.

Louisiana

YOUNGSVILLE—The Youngsville Sugar Co. has plans under way for extensions and improvements in its plant, including the installation of additional machinery. Enlargements will be made in the power department. R. O. Young is general manager.

BASTROP—H. L. Brown, vice-president of the Yellow Pine Paper Mill Co., Orange, Tex., and associates have organized a new company to be known as the H. L. Brown Paper Co., Inc. Property has been purchased at Morehouse Parish, near Bastrop, and work will soon be commenced on a new paper mill, with an initial capacity of 50 tons of kraft paper and pulp per day. It is estimated to cost in excess of $1,750,000, with machinery. A power house will be built. George F. Hardy, 309 Broadway, New York, is engineer.

Maryland

NORTH EAST—The North East Porcelain Co., recently organized, has taken over the former plant of the Maryland Porcelain Co., on Broad Creek, near the city, and will soon commence the manufacture of porcelain products. The factory will be improved and additional machinery installed. E. Kirk Brown is president; Robert C. Reeder, treasurer; and Gustav Glocker, secretary and general manager. The last noted will be in active charge of the project.

Massachusetts

SPRINGFIELD—The B. & H. Paper Co., 65 Water St., has plans in progress for the erection of a new 2-story building, 50x90 ft., on Fulton St., estimated to cost about $25,000.

EVERETT—The Boston Electrolytic Oxygen Co., South Ferry St. and Revere Beach Parkway, manufacturer of industrial oxygen, etc., will commence the immediate erection of a new 1-story plant addition, 24x86 ft., estimated to cost about $14,000, exclusive of equipment. A general building contract has been awarded to the Hudson Construction Co., Everett.

HOLYOKE—The American Writing Paper Co. is perfecting plans for the electrification of its various mills in this section, to replace waterpower operation during certain periods of the year.

Michigan

MONROE—The Monroe Board & Lining Co., First National Bank Bldg., has tentative plans under consideration for the construction of a new local mill for the manufacture of paper and paper board products. William G. Gutman heads the company.

DETROIT—The National Lead Co., 1607 Howard St., is completing plans for the erection of a new 2-story building, 40x130 ft., at Howard and 10th Sts., for general works expansion. Western & Ellington, 1507 Stroh Bldg., are architects.

Missouri

INDEPENDENCE—The Faultless Pneumatic Tire Co., 414 Shuker Bldg., Kansas City, Mo., Frank Y. Allen, head, has preliminary plans under way for the remodeling and improving of a building at Independence, for the establishment of a new plant. An appropriation of about $50,000, is being made for the work and the installation of equipment.

KNOB NOSTER—Frank C. Nicholson, Kansas City, Mo., head of the Harrisonville Brick & Tile Co., Harrisonville, Kan., has leased a brick manufacturing plant at Knob Noster. Improvements will be made and additional equipment installed for brick production and affiliated manufacture. A new kiln will be installed. It is planned to place the plant in service at an early date.

KANSAS CITY—The Cook Paint & Varnish Co., 1319 Grand Ave., has awarded a general contract to Collins Brothers, 1600 Grand Ave., for the erection of a new 2-story and basement plant on Harrison Ave., between 14th and 15th Sts., North Kansas City. It will be 113x162 ft. Work will be placed in progress at an early date. Hans Von Unwerth, 509 Finance Bldg., is architect and engineer.

KANSAS CITY—The Kansas Portland Cement Co., Federal Reserve Bldg., a subsidiary of the International Portland Cement Co., Kansas City and New York, will operate the former plant of the Bonner Portland Cement Co., Bonner Springs, Kan., recently purchased by the parent organization. Plans are nearing completion for enlargements in the works to develop an annual production of 4,000,000 bbl., and operations will soon be commenced. H. Struckmann is president.

New Jersey

NEWARK—The Hanovia Chemical & Mfg. Co., 233 New Jersey Railroad Ave., manufacturer of liquid gold, luster colors, etc., has commissioner Fred A. Phelps, Union Bldg., architect and engineer, to prepare plans for enlargements in its plant for considerable increase capacity in different departments. The company has purchased property on New Jersey Railroad Ave., from Chestnut to Oliver St., for future extensions.

NEWARK — The Crepe Craft Paper Mfg. Co., 121-23 Jackson St., has leased space in an adjoining building for enlargements in its plant.

TRENTON—The Electric Porcelain Mfg. Co., New York Ave., has awarded a contract to Harry Faske, Trenton, for the erection of a 1-story addition to its plant to cost about $14,000, exclusive of equipment.

NEW BRUNSWICK — The American Clay Products Co. has leased the entire plant of the Atlantic Clay Products in East Brunswick Township at an annual rental of $50,000, and will occupy the factory at once. The works will be used for the manufacture of hollow tile products.

KEYPORT—The Architectural Tile Co. is negotiating with the city council for the purchase of municipal property in the vicinity of its plant, to be used for proposed additions.

New York

DEFERIET—The St. Regis Paper Co., Watertown, will soon take bids for the erection of a 1-story addition to its mill at Deferiet, estimated to cost about $60,000.

Ohio

AKRON—The Chemmitex Rubber Co., has leased the tire manufacturing plant of the Interlocking Cord Tire Co., at Mogadore, near Akron, and will take possession at once. The Interlocking company has plans nearing completion for the erection of a new factory in the immediate vicinity of the former plant, and will soon begin work.

ROSSFORD—The Edward Ford Plate Glass Co. has awarded a contract to A. Bentley & Sons, Toledo, for the erection of additions to its plant to cost about $2,000,000, with machinery. Work will be commenced immediately.

Oklahoma

SAND SPRINGS—Chestnut & Smith, operating the local Phoenix refinery, have plans nearing completion for extensive improvements and additions in the oil refining plant to increase the output to 8,000 bbl. per day. It is purposed to have the plant ready for operation in June.

WETUMKA—The Phillips Petroleum Co. is planning for the construction of a new gasoline refining plant on local site.

NEWKIRK—The local oil refinery of the Pirtle-Pittman Co. has been acquired by R. S. Ayres and associates, and a new company will be organized to operate the plant. Plans are under way for extensions and improvements, to include the installation of additional equipment, including "cracking" stills for gasoline production. George Turner will act as assistant general manager.

ARDMORE—The Santa Fe Oil & Refining Co., recently organized, has taken over the local plant of the Chickasaw Refining Co., lately secured at a bankruptcy sale. The new owner will take immediate possession, and plans for extensions and improvements, including the installation of additional equipment. James A. Cotner heads the company.

Oregon

SALEM—The Oregon Pulp & Paper Co. has commenced work on enlargements to its local mill to double, approximately, the present capacity. Machinery to cost about $75,000 will be installed.

Pennsylvania

ALLENTOWN—The Coston Brick Co. has commenced the erection of a new plant on North Quebec St., near the Union Blvd., for the manufacture of concrete brick, tile and kindred products. The machinery installation will be started at an early date.

PHILADELPHIA—A 1-story foundry to cost about $25,000, will be constructed at the plant of the American Engineering Co., Wheatsheaf Lane and Sepviva St.

PHILADELPHIA—The R. E. Tongue & Brothers Co., Allegheny and Amber Sts., manufacturer of chimneys and other glass products, has plans in progress for the erection of a new plant addition to cost approximately $60,000, including equipment. The construction contract has been let to the William Steele & Sons Co., 16th and Arch Sts.

MACUNGIE—Bids are being taken by the East Penn Foundry Co. for the erection of a new 1-story foundry, 140x150 ft., for the manufacture of cast-iron pipe and brass castings. Facilities will be provided for the employment of about 100 men.

South Carolina

GREENWOOD—Fire, March 13, destroyed a portion of the fertilizer mixing plant of the Southern Cotton Oil Co., with loss reported at close to $25,000. It is planned to rebuild.

Tennessee

JOHNSON CITY—The Watauga Cement Products Corp. will construct a number of additions to its plant and install new equipment. It is purposed to double the present capacity. J. W. Warren is president and general manager.

ROCKWOOD—A. E. Venable is organizing a company to construct and operate a local plant for the manufacture of brick, tile and kindred burned clay products. It is expected to develop an initial capacity of 50,000 bricks per day.

Texas

BRECKENRIDGE—The Gulf Production Co. has perfected plans for the construction of six new gasoline plants, casinghead type, in this vicinity, estimated to cost approximately $1,500,000, with machinery. Work on the initial plant will be commenced at once, designed for a daily output of about 8,000 gal. of gasoline.

CORPUS CHRISTI—The city council is arranging for a bond issue of $350,000, for the installation of a municipal gas plant and system.

GAINESVILLE—George Brown and Joseph Curtis, Gainesville, have acquired the plant of the Gainesville Brick Co., near the city limits. A new company with capital of $75,000, will be organized to operate the property, and extensions and improvements made.

FORT WORTH—The Herbert Oil Co., Majestic Bldg., is arranging an appropriation of about $50,000, for extensions in its plant and the purchase of additional equipment.

FORT WORTH—The Helius Casinghead Co., Fort Worth, has plans under way for the construction of a new gasoline plant in the vicinity of Brownwood, Tex., estimated to cost close to $200,000, with machinery. It will be designed for an output of about 10,000 gal. per day.

Vermont

HARTFORD—The Hartford Water Co. has plans under way for the construction of a new water-purification plant in connection with its local waterworks. Weston & Sampson, 14 Beacon St., Boston, Mass., are engineers.

Virginia

ROANOKE—The Roanoke Tire & Rubber Co., Terry Bldg., is arranging a list of equipment for installation at its proposed new plant, and will take bids until about May 1. B. F. Mitchel, Seaboard Bank Bldg., is architect. Alfred Buck heads the company.

SUFFOLK—The Boll Weevil Exterminator Co., recently organized with capital of $500,000, plans for the operation of a local plant for the manufacture of insecticides. Thomas H. Debnam, Suffolk, is treasurer.

Washington

SEATTLE—The Associated Oil Co. has commenced the construction of a new storage and distributing plant on Railroad Ave., comprising a number of buildings, tanks, etc., estimated to cost $75,000.

Canada

FORT ALEXANDER, QUE.—The J. D. McArthur Co., Quebec, is perfecting plans for the construction of a new paper and pulp mill in this vicinity, estimated to cost close to $1,000,000, with machinery. B. W. Thompson is vice-president.

Industrial Developments

LEATHER—The American Hide & Leather Co., New York, will take possession of its new plant at Peabody, Mass., recently purchased, early in April, and will commence operations at once for the manufacture of leather specialties of various kinds. The plant has a rated capacity of 1,500,000 ft. of material per month.

The Castle Kid Co., Camden, N. J., is advancing production at its tannery and is now working on a night and day schedule. Employment is being given to a full force. Both cabrettas and kid in various colors are being produced.

The Texas Hide & Leather Co., Yoakum, Tex., has completed enlargements in its plant, and the new departments have been placed in service. The working force will be increased.

The Standard Kid Mfg. Co., Wilmington, Del., is running under heavy output and giving employment to additional workers.

GLASS—The Owens Bottle Co., Toledo, O., has placed all of its plants on a full 24-hour operating basis, giving employment to maximum working forces. Incoming orders insure the continuance of this schedule for an indefinite period.

Manufacturers of flint glass in all parts of the country have made an agreement with workers for the elimination of the usual "summer suspension" period during the present year, and practically all plants will be continued in operation, allowing employees vacation periods, with restriction that not more than 25 per cent of the shop force shall be absent during any particular period.

Bottle-manufacturing plants in New Jersey, at Millville, Glassboro, Bridgeton and vicinity, are running under heavy production schedules with large working forces. It is expected that this basis will be continued for an indefinite period.

PAPER—The River Raisin Paper Co., Monroe, Mich., is running on a full-time operating schedule, giving employment to a full working force of about 1,000 men. The company has heavy advance orders on hand.

The American Writing Paper Co., Holyoke, Mass., is maintaining production on a capacity schedule with full working forces at its different mills. This basis will be continued indefinitely.

The Eddy Paper Co., Three Rivers, Mich., recently acquired by new interests, has advanced production to about 80 per cent of capacity, and expects to advance this output in the near future.

CERAMIC—The Columbia Clay Products Co., Warrenton, Ore., which has been in financial difficulties for a number of months past, is arranging for the early resumption of operations at its plant.

The Illinois China Co., Lincoln, Ill., has placed its new 10-kiln plant in operation and expects to develop maximum output at an early date. The company specializes in the manufacture of vitreous chinaware, plain white and decorated. The new plant

replaces a works destroyed by fire some time ago.

The Fredonia Brick Co., Fredonia, Kan., manufacturer of face brick, has resumed production at its plant, and expects to maintain operations for an indefinite period. Additions are now in progress and new machinery will be installed in a number of departments.

The Knoxville Brick Co., Knoxville, Tenn., is running full on a basis of about 80,000 bricks per day. Plans are in progress for a number of additions, with new machinery, to increase this output at an early date.

The B. Mifflin Hood Brick Co., Atlanta, Ga., is operating at full capacity at its various brick and tile plants, and reports orders far in excess of those at this same time a year ago. The plants will be continued on the present basis indefinitely, giving employment to full working forces.

RUBBER — Tire manufacture is advancing in the Akron, O., district, and total current production is now approximately 100,000 completed tires daily at all plants. Of this aggregate, the Goodyear Tire & Rubber Co. is running on a schedule of close to 30,000 tires per day, with the Firestone Tire & Rubber Co. maintaining about this same output. The Goodrich Rubber Co. is manufacturing more than 20,000 tires daily; the Miller Rubber Co., 8,500; the General Tire & Rubber Co., 2,200; the Seiberling Tire & Rubber Co., 2,000; the India Rubber Co., more than 700; the Swinehart and Mohawk Tire & Rubber companies, 1,000 each; and the American Rubber Co., 750 tires daily.

The Bourn Rubber Co., Providence, R. I., has closed its plant temporarily, pending the outcome of a strike of operatives, totaling about 500. The company has refused to meet a demand for a wage advance of 10 per cent.

C. H. Booth, receiver for the Republic Rubber Co., Youngstown, O., is arranging plans for a reorganization, with expectation of placing all mills of the company on the active list at an early date.

IRON AND STEEL—The Carnegie Steel Co. is arranging to blow in its blast furnace at Niles, O., following a 7-year idle period. The plant has a rated output of 300 tons of pig iron daily, and will give employment to about 275 men, of which 200 will operate on the day turn, and the remainder on night shift.

The Penn-Seaboard Steel Corp., Philadelphia, Pa., has advanced production at its Chester, Pa., mills to 100 per cent capacity, and is said to have orders on hand to insure this schedule for at least 90 days. The plant has been running at from 80 to 90 per cent since last fall.

The Virginia Iron, Coal & Coke Co., Roanoke, Va., is arranging to blow in another blast furnace at its plant.

The Adrian Furnace Co., Du Bois, Pa., is planning to place the torch to its local blast furnace at an early date.

The Titusville Iron Co. and the Titusville Forge Co., Titusville, Pa., affiliated organizations, are running at full capacity, giving employment to about 1,300 operatives. Wages have been advanced at the plants 10 per cent, effective April 2.

The Kittanning Iron & Steel Mfg. Co., Pittsburgh, Pa., a subsidiary of the Carbon Steel Co., has blown in its Rebecca furnace in the Kittanning, Pa., district.

Following the adoption of an increased operating schedule with two extra shifts in the blooming mill, the Eastern Steel Co., Pottsville, Pa., is planning for third shift at an early date, making full 24-hour service. An increased working force will be employed.

The Newton Steel Co., Youngstown, O., is operating at 17 sheet mills under capacity output.

The Low Moor Iron Co., Low Moor, Va., is planning to blow in its local blast furnace at an early date.

Of a total of 117 sheet mills in the Mahoning Valley section, Youngstown, O., only 2 such plants are now inactive; 115 mills are running full with normal working forces.

MISCELLANEOUS—The American Smelting & Refining Co., New York, is operating its copper refinery at Chrome, N. J., at maximum capacity, on a basis of about 20,000,000 lb. of refined copper per month. A full working force is engaged.

The Air Reduction Sales Co., New York, has completed its new plant at Baltimore, Md., and will place the factory in service at once for the production of commercial oxygen.

The Sinclair Refining Co., New York, has resumed production at its Mereaux, La., oil refinery, and purposes to develop maximum output.

New Companies

HENRY LANGE, INC., Kearny, N. J., has been incorporated with a capital of $25,000, to manufacture glass products. The incorporators are C. Martens and Henry Lange, 177 Windsor St., Kearny. The last noted represents the company.

THE FEDERALOID CORP., Brooklyn, N. Y., care of John Bogart, 63 Park Row, New York, representative, has been incorporated with a capital of $40,000, to manufacture celluloid products. Incorporators: D. I. Michaelson, J. Levy and J. Rottiner.

THE VENEKLASEN CLAY PRODUCTS CO., Hamilton, Mich., has been incorporated with a capital of $30,000, to manufacture burned clay wares of various kinds. The incorporators are Benjamin J. and John H. Veneklasen, both of Zeeland, Mich.

THE SCOLLAY PAPER CO., Boston, Mass., has been incorporated with a capital of $100,000, to manufacture paper products. John J. Delany, president; and M. F. Boyle, Mattapan, Mass., treasurer. The last noted represents the company.

THE LAWRENCE MFG. CO., Washington, D. C., care of the Capital Trust Co. of Delaware, Dover, Del., representative, has been incorporated under Delaware laws with capital of $15,000,000, to manufacture chemical specialties, cleansing powders, etc. The incorporators are John H. Lawrence, Washington; John H. Watkins and Frank J. King, New York.

THE KEARNEY-DAILEY GLASS CO., 407 North Elizabeth St., Chicago, Ill., has been incorporated with a capital of $100,000, to manufacture glass products. The incorporators are James M. Dailey, Thomas S. Kearney and James J. McMahon.

THE TRANSLOID PRODUCTS CO., Danbury, Conn., has been incorporated with a capital of $500,000, to manufacture glue, isinglass, gutta percha, rosin and kindred products. The incorporators are Charles Hetzel, William F. Buzaid and T. A. Keating, 118 Liberty St., Danbury.

THE ZEMCO CHEMICAL CO., New York, care of J. J. Hanrahan, 7 East 42d St., representative, has been incorporated with a capital of $100,000, to manufacture chemicals and chemical byproducts. The incorporators are L. Hoffman, J. M. Habstedt and D. Currubi.

THE URADIA CHEMICAL CORP., Houston, Tex., has been incorporated with a nominal capital of $5,000, to manufacture chemical products. The incorporators are J. E. Hall, R. A. Barrett and O. D. Thomas, all of Houston.

THE PHILLIPS PETROLEUM PRODUCTS CO., Boston, Mass., has been incorporated with a capital of $650,000, to manufacture petroleum and refined oil byproducts. Ralph B. Phillips is president; and Thomas F. Thornton, 1207 Columbus Ave., Boston, treasurer. The last noted represents the company.

THE H. H. DIERKES CO., INC., Union Hill, N. J., has been incorporated with a capital of $25,000, to manufacture brick and other burned clay products. The incorporators are Otto H. Harting, O. Venion, Jr., and Henry H. Dierkes, 144 Bergenline Ave., Union Hill. The last noted represents the company.

THE ALCON CHEMICAL ENGINEERING CO., 308 Capitol Theater Bldg., Detroit, Mich., has been incorporated with a capital of $10,000, to manufacture chemicals chemical byproducts, etc. The incorporators are J. Howard Smith, J. A. Miller and J. F. Williams, 414 Fourth Ave., Royal Oak, Mich. The last noted represents the company.

THE SOUTHERN ALPHA TILE CO., Tampa, Fla., care of the Colonial Charter Co., Ford Bldg., Wilmington, Del., representative, has been incorporated under Delaware laws with capital of $100,000, to manufacture tile and other ceramic products.

THE WANNER MALLEABLE CASTINGS CO., 10 South La Salle St., Chicago, Ill., has been incorporated with a capital of 320,000 shares of stock, no par value, to manufacture iron and other metal castings. The incorporators are Harry C. Wanner, J. Fred Reeve and Bernard W. Vinissky.

THE CONCRETE BRICK & TILE CO., Wildwood, N. J., care of Leap, Sharpless & Way, Wildwood, representatives, has been incorporated with a capital of $100,000, to manufacture concrete products. The incorporators are Charles W. Craythorn, William H. and I. L. Austin, all of Wildwood.

THE F. T. PARSONS PAPER CO., Washington, D. C., care of the Capital Trust Co. of Delaware, Dover, Del., representative, has been incorporated under Delaware laws with capital of $200,000, to manufacture paper products. The incorporators are Frank T. Parsons, Washington; Benjamin F. Bond, Jr., and Bert Reid, Baltimore.

Coming Meetings and Events

AMERICAN ASSOCIATION OF CEREAL CHEMISTS will hold its ninth annual convention at Hotel Sherman, Chicago, June 4 to 9.

AMERICAN ASSOCIATION OF ENGINEERS will hold its annual convention in Norfolk, Va., May 7 to 9.

AMERICAN ELECTROCHEMICAL SOCIETY will hold its spring meeting May 3, 4 and 5, 1923, at the Commodore Hotel, New York.

AMERICAN FOUNDRYMEN'S ASSOCIATION will hold a meeting in Cleveland, O., April 28 to May 4.

AMERICAN GAS ASSOCIATION will hold its annual convention the week of Oct. 15 at Atlantic City.

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS will hold its summer meeting June 20-23 at Wilmington, Del.

AMERICAN LEATHER CHEMISTS ASSOCIATION will hold its twentieth annual convention at the Greenbrier, White Sulphur Springs, W. Va., June 7, 8 and 9.

AMERICAN OIL CHEMISTS' SOCIETY will hold its annual meeting at the Eastman Hotel, Hot Springs, Ark., April 30 and May 1.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS will hold its spring meeting May 28 to 31 in Montreal, Canada.

AMERICAN SOCIETY FOR TESTING MATERIALS will hold its twenty-sixth annual meeting at the Chalfonte-Haddon Hall Hotel, Atlantic City, beginning Monday, June 25, 1923, and ending either Friday or Saturday of that week.

AMERICAN WELDING SOCIETY will hold its annual meeting April 25 to 27 at the Engineering Societies Building, New York.

AMERICAN ZINC INSTITUTE, INC., will hold its fifth annual meeting at the Hotel Chase, St. Louis, May 7 and 8.

CANADIAN INSTITUTE OF CHEMISTRY will hold its annual meeting in Toronto, May 29 to 31.

ENGINEERING SECTION of the National Safety Council will hold a mid-year safety conference April 17 in the auditorium of the Western Society of Engineers.

INTERSTATE COTTON SEED CRUSHERS ASSOCIATION will hold its annual convention at Hot Springs, Ark., May 2 to 4.

IRON AND STEEL INSTITUTE (London) will hold its annual meeting May 10 and 11 at the House of the Institution of Civil Engineers, London, S. W. 1.

NATIONAL ASSOCIATION OF MANUFACTURERS OF THE UNITED STATES OF AMERICA will meet in annual conference May 14 to 16, inclusive, at the Waldorf-Astoria, New York City.

NATIONAL EXPOSITION OF CHEMICAL INDUSTRIES (NINTH) will be held in New York Sept. 17-22.

NATIONAL FOREIGN TRADE COUNCIL has postponed its annual conference from April 25, 26 and 27, to May 2, 3 and 4. It will be held in New Orleans, La.

NATIONAL LIME ASSOCIATION will hold its fifth annual convention at the Hotel Commodore, New York City, June 13 to 15.

NATIONAL SYMPOSIUM ON COLLOID CHEMISTRY will be held at the University of Wisconsin, June 12 to 15.

SOCIETY OF CHEMICAL INDUSTRY, Canadian Section, will meet in Toronto, May 29 to 31.

NEW JERSEY CHEMICAL SOCIETY holds a meeting at Stetters Restaurant, 842 Broad St., Newark, N. J., the second Monday of every month.

SOCIETY FOR STEEL TREATING — Eastern sectional meeting will be held June 14 and 15, in Bethlehem, Pa.

SOCIETY OF INDUSTRIAL ENGINEERS, with headquarters in Chicago, will hold its spring convention in Cincinnati, April 18, 19 and 20, 1923. The major subject will be "Management Problems of the Smaller Plants."

The following meetings are scheduled to be held in Rumford Hall, Chemists' Club, East 41st St., New York City; April 13—Society of Chemical Industry (in charge), American Electrochemical Society, Société de Chimie Industrielle, American Chemical Society, joint meeting. May 4—American Chemical Society, regular meeting. May 11—Société de Chimie Industrielle (in charge), American Chemical Society, American Electrochemical Society, Society of Chemical Industry, joint meeting. May 18—Society of Chemical Industry, regular meeting. June 8 — American Chemical Society, regular meeting.